

International Abstract of Surgery

Supplementary to
Surgery, Gynecology and Obstetrics

Volume 77
January to June, 1921

EDITED BY
THE SURGICAL PUBLISHING COMPANY OF CHICAGO
26 EAST 11TH STREET, CHICAGO

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INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 72

JANUARY, 1941

NUMBER I

SURGERY AND THE BASIC SCIENCES

TRAUMATIC SHOCK

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THE literature and findings to be reviewed apply more particularly to the delayed or secondary shock which may follow trauma. Many of the findings and symptoms of this type of shock appear to be the result of a peripheral circulatory insufficiency resulting from a decrease in the effective blood volume. A distinction between primary and secondary traumatic shock appears to be necessary because the former, occurring at the time of injury, is thought to be neurogenic in origin, resulting from the reflex vascular effects of pain and psychic stimuli. When speaking non-specifically of shock, one usually refers to the secondary type, and most of the experimental work on shock has been directed toward an understanding of its etiology and mechanism.

The following changes in the blood and circulation are generally agreed upon as occurring in traumatic shock.

- 1 Capillary stagnation, which leads to reduction of the effective blood volume (oligemia), as evidenced by
 - a Hemoconcentration
 - b A decrease in venous return to the heart with a resulting reduction in cardiac output
 - c A decrease in circulating blood volume by exemia
- 2 Decreased tone of skeletal muscles, decreased arterial pressure, collapsed veins, and depressed respiration
- 3 Anoxemia
- 4 Decrease in the alkali reserve (sodium bicarbonate) of the blood (acarbia)

- 5 Partial compensation for the tendency to acidosis by a reduction in the carbonic-acid content of the blood (acapnia)
- 6 An actual decrease in the pH of the blood (acidemia or hyperhydria), which results because of the fact that there is only partial compensation for the acidosis
- 7 A rise in the plasma potassium, which is interpreted as an indication of a disturbance in cell permeability

PHYSIOLOGICAL EXPLANATION OF THE CIRCULATORY CHANGES OCCURRING IN SHOCK

For a long time, the decided fall in blood pressure was regarded as the primary feature of shock and attention was directed to determining its cause. There are three general ways in which blood pressure may fail.

- 1 Myocardial failure. The following evidence indicates that myocardial failure does not occur in shock.
 - a The heart continues to beat vigorously after respiration has ceased
 - b If the heart of a shocked animal is supplied with adequate fluid, the blood pressure may be returned to normal or above normal (300 mm. of Hg in dogs) (15, 57, 63)
 - c Direct observation of the heart in shocked animals shows it to be beating vigorously although propelling little blood because of deficient venous return (20, 21)
 - d The veins are collapsed in shock while in myocardial failure they are distended (46)

2. Decreased peripheral resistance vasomotor exhaustion. The bulk of evidence is against this factor as playing a primary rôle in shock, although it may play some part.
 - a. Vasomotor reflexes, both pressor and depressor are unimpaired in the shocked animal (71-72). This does not prove that vasomotor tonus is not depressed. The reflex vasomotor activity which exists in early shock may be different from the continuous vasoconstrictor tone of this center.
 - b. Arterial resistance to perfusion is maintained or even increased in the early stages of shock (27).
 - c. Early in shock there is a decreased venous return to the heart and a diminished minute output, yet there is no fall in the blood pressure. This would indicate an increased activity of the vasomotor system (46).
 - d. The arterioles in shock are in a state of maximal contraction (28, 56-80).

The last three statements point to the presence of vasoconstriction in shock, and for this reason it is argued that epinephrine, ephedrine, and synephrine should not be used. However, there are several types of shock in which these pressor drugs are useful namely barbiturate poisoning, anaphylactic shock, and shock following section of the splanchnic nerve, excision of the celiac ganglion, or splanchnic congestion (48).

- e. Sympathectomized animals survive in good condition without a vasomotor system (4, 46).
3. Reduction in blood volume (actual or effective blood volume)

It has been definitely established and repeatedly confirmed that a marked decrease in the effective blood volume is an outstanding feature of shock regardless of the method by which shock is produced (35, 5-74).

From the foregoing considerations it appears that the fall in blood pressure in shock results from a decrease in the effective circulatory volume. Vasomotor failure may play a part in some types of shock, but in no instance of uncomplicated shock does the blood-pressure decline appear to be due to cardiac failure.

One may look upon the circulatory insufficiency of shock as a manifestation of an uncompensated imbalance between the volume of blood and the volume capacity of the vascular system. According to Moon (67) this may occur in two ways

1. Reduction in blood volume
 - a. Directly as in severe hemorrhage
 - b. Indirectly (1) by transudation of plasma (exemia) through capillary walls into tissues, or (2) through perspiration, vomiting and diarrhea
2. Increase in the volume capacity of the vascular system

If the entire capillary stream bed of the skeletal muscles alone were open simultaneously the volume capacity would about equal the normal blood volume of the body. Other visceral organs have a similar potential capacity (53).

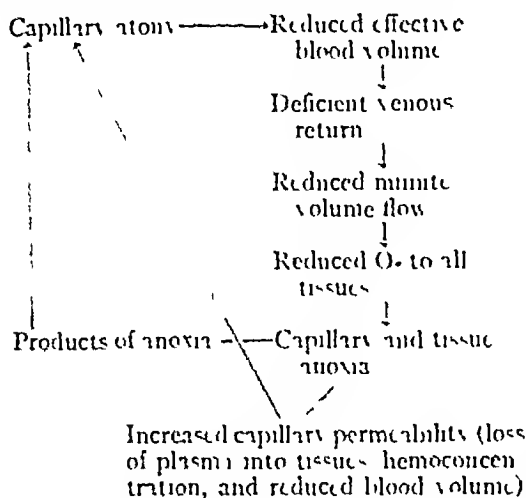
From the evidence available at present, it appears reasonable to suppose that the following sequence of events occurs in shock (46, 64, 67).

1. Stagnation of blood in the capillaries. This increases the volume capacity of the vascular system and leads to a reduction in the effective circulatory volume. A reduction in the venous return to the heart, hence a reduction in cardiac output.
3. Anoxia results from the capillary stasis and reduced cardiac output. Increased capillary permeability results from the anoxia and there is a loss of colloids and fluid from the blood.
4. A loss of blood plasma into the tissues causes an actual reduction in the circulating blood volume. It also causes the hemoconcentration characteristic of shock.
5. There is thus set up a self-perpetuating vicious cycle (see diagram) which leads eventually to a peripheral circulatory failure and shock.
6. Early in shock, compensatory vasoconstriction maintains the blood pressure near its normal level. The vasoconstriction further decreases the volume flow into the capillaries and by so doing may actually aid the development of anoxia. Later the venous return and cardiac output become so small that the most extreme contraction of the arterioles is unable to maintain arterial pressure. Also in the later stages, anoxia of the vasomotor center causes vasomotor failure. The evidence indicates that capillary stasis, reduced venous return, reduced cardiac output, and hemoconcentration occur before there is any evidence of vasomotor failure.

According to this description, there seem to be two major factors involved in the production of shock (46, 64, 67).

1. Capillary atony and stasis
2. Anoxia

Either factor alone brings the other into operation and sets up a self-perpetuating cycle. The following diagrammatic presentation of the sequence of events is modified from Moon (64, 67)



THEORIES PROPOSED TO EXPLAIN THE ETIOLOGY OF SHOCK

What fundamental factor attendant upon severe trauma or surgical operations leads to the clinical condition known as traumatic or surgical shock? Any acceptable theory must be compatible with the sequence of events which have been listed if one accepts these facts and their sequence as correct. Some of the many theories proposed will now be considered.

I Vasmotor exhaustion theory (17, 18, 19) According to this theory, exhaustion or paralysis of the vasomotor center occurs as a result of its bombardment by sensory impulses from the traumatized area. Evidence has already been considered which indicates that vasomotor exhaustion is not the primary cause of shock.

II Acidosis theory It is quite generally agreed that there is a decrease in the alkaline reserve in traumatic shock and the question arises as to whether this is a primary feature. Since the intravenous injection of acids sufficient to reduce the alkaline reserve to a very low level (severe uncompensated acidosis) fails to produce shock, this cannot be the primary cause but is a secondary complication, at least partially due to the accumulation of lactic acid caused by the anoxia (59, 62, 67, 70, 83). Others (39, 40, 41, 42, 43, 46) prefer to call the reduced alkaline reserve which occurs in shock "acarbemia" and point out that the acarbemia which occurs at high altitudes, in acapnia, in carbon-monoxide asphyxia, and in traumatic shock

is not truly acidotic in type. Henderson (46) points out the fact that in simple acidosis, such as is produced by the injection of acid, by the feeding of ammonium chloride, and by nephritis, or that associated with diabetic coma, the inhalation of carbon dioxide is definitely harmful and may be fatal, but if acarbemia is due to shock, hyperventilation, or carbon monoxide asphyxia, carbon dioxide inhalation raises the blood bicarbonate and is of definite benefit. He regards the acarbemia of shock as the result of acapnia and considers the lactic acid accumulation as unimportant in its production.

III The acapnia theory (38, 39, 40, 41, 42, 43, 46) According to this theory, failure of the circulation (shock) is brought about by a failure of the venopressor mechanism (the mechanism which is responsible for the venous return to the heart) as a result of a decrease in the carbon dioxide content of the blood. Hyperventilation induced by painful stimuli, anesthesia, or emotional excitement, together with a direct loss of carbon dioxide by visceral exposure, results in a decrease in the blood carbon dioxide (acapnia). This in turn leads to a depression of the motor centers in the spinal cord responsible for the maintenance of tone in skeletal muscle and results in hypotonia and flaccidity. Muscular tone and intramuscular pressure are regarded as essential features of the venopressor mechanism. Hypotonia results in a stagnation of blood in the capillaries and failure of the venous return. Also, the acapnia depresses respiration and the respiratory component of the venopressor mechanism becomes less effective. Finally, the decreased carbon dioxide content of the blood results in a migration of alkali and fluid into the tissues and leads to acarbemia ("acidosis"—reduced alkali reserve) and to oligemia. Supporters of this conception have shown (44, 46) that carbon dioxide has a powerful influence on venous pressure, whereas it exerts relatively little direct influence on arterial pressure. They have measured intramuscular tension and found that it is decreased in patients several hours after major surgical procedures, in wound shock, and in hyperventilation, whereas it is increased by carbon dioxide inhalation and by the administration of strychnine (3, 45, 46, 52). It is claimed that shock produced by excess of curare, by spinal anesthesia, and by transection of the spinal cord is fundamentally due to loss of muscle tone with failure of the venous return.

In many ways this conception is an attractive one. It is compatible with the facts given above. However, others have been unable to produce shock by hyperventilation. Janeway and Ewing (49) produced shock by manipulation of the in-

testine in animals in which the blood carbon dioxide was kept constant by supplying the gas through a tracheal cannula. Moon's (65, 67) post mortem observations have shown that most of the stagnation occurs in the visceral capillaries rather than in those of the skeletal muscle. Cannon (15) claims that there is insufficient hyperpnea in wound shock to be of any importance, but Henderson points out that an increase of breathing to twice the normal value is scarcely observable.

IV. *The theory of traumatic toxemia* (11, 13, 15, 16, 60, 61, 65, 73, 80, 90). This theory was the outgrowth of the observations made by the Special Committee on Shock, a division of the British Medical Research Committee, during the first World War. Briefly stated, it postulates that traumatic shock is caused by a toxin absorbed from injured tissue. The evidence upon which it is based is chiefly circumstantial. For example, it was observed that shock appeared gradually after wounds, that the greater the damage the greater was the shock, that anything checking absorption from the injured area delayed the appearance of shock (for example, (61, 73) a tourniquet—the removal of which was promptly followed by shock) and that removal of injured tissue by debridement or amputation brought improvement. In the laboratory the theory was apparently supported by experiments in which a limb was traumatized without results as long as its artery and vein were ligated, but on removal of the ligatures, shock developed at once. A few years prior to the war Dale and Lakdaw (11) had reported on the pharmacological action of histamine. Since this amine produced a picture similar to that of shock it was at once suggested that histamine or an histamine-like substance was the etiological agent. Much of the subsequent investigation has been concerned with a detailed comparison between the phenomena of traumatic shock and those of toxic shock produced by histamine or similar substances.

Direct crucial evidence in support of this theory is lacking. The question as to whether toxic substances can be extracted from traumatized tissue or are present in the blood coming from a traumatized area has given rise to a very controversial literature, but the most convincing evidence is against it (4, 5, 6, 47, 60, 68, 69, 81). Phemister (69) obtained no vasodilator effects when blood from the traumatized leg of one dog was collected in a viviparous flask and injected into another dog. O'Shaughnessy and Slone (68) perfused the traumatized limbs of shocked cats and were never able to obtain a perfusate that had any toxic effects. Dragstedt and Mead (26) were unable to

find any vasodepressor toxin in the blood and lymph of dogs during experimental surgical shock. Smith (81) Parsons and Phemister (69) and Roome and Willson (77) were all unable to confirm the findings of earlier workers who had obtained toxic extracts from injured tissue.

It is difficult to interpret certain of these experiments. For example the failure of shock to appear following trauma to an extremity in which the vessels had been ligated is attributed by supporters of the toxemia theory to be due to the prevention of absorption of toxin from the injured limb. Supporters of the theory of local fluid loss say that shock did not develop because ligation of the vessels had prevented local loss of fluid and, finally, those who believe shock is due chiefly to nervous-reflex phenomena say that shock did not develop because the ischemia produced an anesthetic limb and thus prevented the operation of nervous reflexes.

To summarize the theory of traumatic toxemia is at present based upon circumstantial evidence. No one up to the present time, has convincingly demonstrated the existence of such a toxin by direct methods.

Recently Moon and Kennedy (65) have produced shock by the introduction of a piece of normal and presumably sterile muscle into the peritoneal cavity of a healthy animal. Moon and his associates (66) have also produced shock with high-voltage abdominal x rays delivered to the abdomen. These results are interpreted in support of the toxemia theory.

V. *The adrenal theories of shock* (12, 32, 33, 86, 87). At least three distinct theories have been suggested which assign a major rôle to the adrenal glands in shock.

1. Lack of epinephrine secretion leads to a peripheral vasodilatation and the shock syndrome. The following evidence indicates that the theory is untenable:
 - a. The peripheral vessels (arterioles) are not dilated (17, 8, 46, 56, 57, 80).
 - b. Adrenalin secretion is unaltered during shock (Stewart and Rogoff, 75, 76).
 - c. Complete loss of epinephrine secretion does not produce shock (Stewart and Rogoff (83a)).
2. Hyperactivity of the sympatho-adrenal mechanism excited by pain, emotion, or tissue irritation may result in a prolonged arteriolar constriction. This eventually produces capillary and tissue anoxia and thus initiates the vicious cycle of shock. This theory was supported by the following evidence:

- a There appeared to be an increase in the blood epinephrine content in shock (Bedford, 2)
- b In decerebrated cats exhibiting sham rage (hyperactivity of sympathetic adrenal system), there is a decreased blood volume, capillary stasis, and hemoconcentration. If ergotoxin is given, which paralyzes the thoracolumbar constrictors, these effects are not observed. Also, cats that have been previously sympathectomized do not show these changes (Freeman, 32)
- c Slow infusion of epinephrine over a period of hours can produce shock (Freeman, 32, Bainbridge and Trevan, 1, Erlanger, Gasser and Meek, 261, 35)

The following evidence appears to oppose this explanation

- a Such quantities of epinephrine as are necessary to produce shock in experimental animals never exist as a result of stimulated adrenal activity (35, 63, 64)
- b Adrenalectomized animals maintained on cortical extract can readily be thrown into shock by the usual methods (Swingle, 86, 87)
- c Shock may be produced in sympathectomized animals as easily as in normal animals (Freedlander and Lenhart, 31)

The evidence derived from such studies indicates that the phenomenon of shock can be produced by a prolonged vasoconstriction apparently as a result of anoxia. This is supported by the experiments of others in which the circulation was retarded mechanically by adjustable clamps on the aorta or vena cava for varying periods. When these clamps were removed, shock developed (Jeneway and Jackson, 50, Erlanger, Gesell, Gasser, and Elliot, 28)

The opposing evidence cited appears to eliminate sympatho-adrenal hyperactivity as an essential factor in the development of shock, or at least in the development of experimental shock in the anesthetized animal. This does not prove, however, that such a mechanism may not contribute at least in part to the development of traumatic shock in man. An anesthetized animal is not comparable to an excited, conscious soldier. It is hard to believe that nervous factors do not play at least some part in the latter instance (63)

- 3 Shock is due to adrenocortical insufficiency, i.e., a lack of the cortical hormone. Since adrenalectomized animals show a form of circulatory failure very similar to that of shock, and since injections of cortical hormone produced recovery in animals practically moribund as the result of profound surgical shock, adrenocortical insufficiency was suggested (Swingle, Pfiffner, 86, 87)

A detailed comparison between the physiological changes in traumatic shock and those found in adrenocortical insufficiency reveals many similarities (87)

- a Reduction in the blood volume, cardiac output, and volume flow
- b Hemoconcentration
- c Increased cardiac rate, decreased arterial and venous pressures
- d Diminished renal function. Low basal metabolic rate, low body temperature
- e Active vasoconstriction. Normal cardiac capacity
- f Acapnia and acarbica
- g Increase in blood potassium. Decrease in sodium and chloride
- h Abnormal sensitivity to cold, anesthetics, toxins, infections, hemorrhage, and trauma

The mechanism of death in adrenocortical insufficiency is not yet established. However, cortin is believed to affect the permeability of cells, to regulate capillary tonus, and perhaps to exert some specific effect on the kidney tubules. It is, therefore, important in the regulation of water and salt balance and a deficiency leads to anhydremia, hyponatremia, hypochloremia, and hyperkalemia. Some think death is due to potassium poisoning (88, 93) or to loss of potassium from the cells (37, 58)

Recently, Scudder (79) has emphasized that one common denominator in shock, whether produced by tissue abuse, fluid loss, hemorrhage, the injection of toxins, adrenocortical destruction, or sympathetic stimulation, is a rise in plasma potassium. He does not conclude, however, that shock is due to potassium poisoning alone.

According to Moon (67) one major objection to the adrenal deficiency theory is the element of time. The average survival period after a skillfully performed adrenalectomy is ten days for dogs, and twelve days for cats. Moreover, the animals are apparently in perfect health until from one to three days before death. If an adrenalectomized animal which has been maintained by injections of cortin is suddenly deprived of this substance, shock does not develop immediately,

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Spencer, F. R., Hegner, C. I., and Black, W. C.
Benign and Malignant Tumors of the Jaw
Arch Otol Rhinol 1930, 3, 100

Of the 10 cases reported, 12 were malignant tumors and 4 benign tumors. The age of the patients ranged from two weeks to eighty-one years. The average age is forty-nine years plus. There were 4 patients of the ages of two weeks, two years, eight years, and sixteen years, respectively. Three patients were female and 16 male, which finding corresponds with the more frequent occurrence of malignant disease in males. In 13 cases a clinical diagnosis of carcinoma was made. One patient had a basal cell carcinoma on one side of the jaw and a squamous cell carcinoma on the other. In 10 cases roentgen therapy was given one or more times during the course of the disease. Only 8 patients were operated on, as in many cases the tumor was inoperable. All those with malignant tumor were made more comfortable and their lives prolonged by radium and roentgen therapy.

JOSEPH K. NAYAT, M.D.

Patey, D. H. The Treatment of Mixed Tumors of the Parotid Gland. *Brit J Surg* 1930, 3, 9.

The present article regarding the treatment of mixed tumors of the parotid gland is based partly on the experience of others as revealed in the more recent literature and partly on cases from the surgical and radiological records of the Middlesex Hospital.

A very important question is the risk of complications, particularly of spontaneous malignant change, during the course of the gradual increase in size of the tumor. It has frequently been asserted, chiefly as a justification for early surgical intervention, that such spontaneous malignant change is common. The author knows of no reported case of carcinoma of the parotid in which the evidence is complete that it developed from a mixed tumor, though it may justly be argued that the carcinoma may destroy the evidence of its origin. This type of possible malignant change in a mixed tumor must therefore be regarded at present as non-proved. The other type of possible malignant change—the taking on of characteristics of malignancy, particularly in the form of wide spread local infiltration without change of histological type—is well established.

As a result of the author's analysis his conclusions and present position of the treatment of mixed parotid tumors may be summarized as follows.

The natural course of mixed parotid tumors is to increase in size at varying rates, which leads to a

corresponding degree of deformity, but otherwise causes very little disability. Spontaneous malignant change in a mixed tumor is so rare that for practical purposes it may be ignored. Surgical enucleation alone may be satisfactory, but in too high a proportion of cases to be regarded with equanimity recurrence occurs, and in some cases such recurrence leads directly to the death of the patient. There should be no hurry to treat these tumors. A period of observation to determine the rate of growth may be advantageous. In mixed parotid tumors appearing late in life and in slowly growing tumors appearing earlier the correct treatment may be to do nothing. Radical excision of the parotid gland is too deforming to be a routine treatment of mixed parotid tumors. There may, however, be exceptional cases in which it is the correct treatment and in which the price of complete facial palsy is a justifiable one for the patient to pay. Irradiation alone is not a satisfactory form of treatment. It may, however, be a useful diagnostic measure. Pre-operative irradiation is valuable since it renders the capsule of the tumor tougher and less liable to rupture during operation. Enucleation followed by irradiation is on present evidence the best active treatment for mixed parotid tumors.

JOSEPH K. NAYAT, M.D.

EYE

Morgan, O. G. Some Cases of Traumatic Myopia. *Brit J Ophthalmol*, 1930, 24, 403.

After direct trauma to the eye, one not infrequently notes the development of myopia with or without actual damage to the lens itself.

According to the intensity of the injury one can distinguish four different types.

1. That due to spasm of the ciliary muscle associated either with spasm of the sphincter of the pupilla or with traumatic mydriasis. In these cases from 1 to 3 diopters of myopia may appear, which last a few days, as a rule, and then disappear without treatment or under treatment with atropine.

2. That due to partial rupture of the fibers of the suspensory ligament of the lens associated with iridodonesis. This may be responsible for from 5 to 6 diopters of myopia which is often permanent, and does not disappear under treatment with atropine.

3. That due to changes in the lens itself. This is often variable in amount and may be associated with astigmatism.

4. That due to more serious damage to the anterior or posterior coats of the eye, which presumably has caused some axial lengthening.

Cases of injury associated with rupture of the suspensory ligament and iridodonesis are not un-

common. There are probably two factors in the production of myopia.

1. The more anterior position of the lens itself.
2. The fact that the lens in these circumstances becomes more globular.

In congenital dislocation of the lenses the refraction is usually found to be very highly myopic because of the second of these factors.

LESLIE L. MCCON, M.D.

RAR

Anderson, N.: Convulsions and Post-Convulsive Paralysis of Orogenic Origin: Some Clinical Observations and Case Records. *J. Laryngol. & Otol.*, 1940, 55, 303.

A convulsion frequently draws attention, for the first time, to the presence of serious and, up to then, unsuspected intracranial complication in patient with well developed aural suppuration, whether acute or chronic. On the other hand, in young children only convulsion may be the first clinical manifestation of the presence of an acute otitis media and, as such, has only transient diagnostic significance. Focal, unilateral, Jacksonian, or generalized convulsions associated with established aural suppuration are always due to cortical irritation, whether from outside the cortex or from cortical thrombophlebitis, or from extension toward the cortex of an intracerebral (such as a temporal lobe) abscess. Convulsions develop under number of conditions in association with suppurative ear conditions. The convulsions may be generalized or Jacksonian (focal).

At the onset of an acute otitis media in infants, when the condition is due to what is termed meningismus, the convulsion is due to the ear condition alone as reflex irritative cerebral phenomenon, and not to an actual inflammatory cerebral cortical involvement. It might be accounted for by an acute otitic hydrocephalus. This could be diagnosed and confirmed clinically only by performing a lumbar puncture and recording the pressure of the cerebrospinal fluid. Tuberculous meningitis is common cause of convulsions in infants and young children. Convulsions are not uncommon in children, but are rare in adults. The convulsion may arise from (1) encephalitis, otogenic, non-suppurative (rare), (2) an extradural abscess (3) subdural abscess (4) abscess of the temporal lobe, with extension to the cortex (5) otitic hydrocephalus and (6) otogenic meningitis. If the patient has an acute otitis of recent origin, the question as to whether the convulsion is due to any of these causes other than meningitis (6) does not arise. It can then be due to only (1) otogenic meningismus, in infants or young children (b) otogenic meningitis (c) extra-aural causes, e.g. pneumonia in infants and young children or (d) possibly an encephalitis (this cannot be diagnosed at this stage) or tuberculous meningitis. At a later stage of the acute otitis, 7 to 14 days after the first fourteen days, any of the causes from (1) to (6) may operate.

The following factors are guides to treatment in the presence of a convulsion of otogenic origin. With the onset of convulsion.

1. The presence of an acute earache, the ear should be examined, and a myringotomy performed, the pus being sent for culture to ascertain the organism. If there is any suspicion of nuchal rigidity a lumbar puncture is forthwith indicated.

Lumbar puncture is also indicated if the convulsions recur or the patient fails to respond rapidly to the myringotomy.

2. When the acute otitis media is well established lumbar puncture is immediately performed, with measurement of the fluid pressure and cytological, chemical, and bacteriological examination of the fluid. A complete neurological examination is made, followed by mastoid operation with exposure of the dura of the temporal lobe. The dura and temporal lobe should be explored by brain puncture, after the extended mastoid operation has excluded the presence of an extradural abscess in the middle cranial fossa. The lateral sinuses should also be explored by puncture. The radical mastoid operation is not required, as a rule.

3. In the presence of chronic ear discharge an immediate radical mastoid operation is undertaken with extensive exposure as in Paragraph 3, after the lumbar puncture and neurological examination.

NOAN D. FARRINGTON, M.D.

PHARYNX

Troot, H. H.: Ludwig's Angina. *Arch. Surg.* 1940, 4, 532.

The author gives a rather complete description of the history of Ludwig's angina and especially of the connection of Ludwig's name to the disease. He suggests that the difference in the definition of the disease accounts for the tremendous diversity of the results. The mortality quoted from most authors varied between 5 and 75 per cent. He believes that among the cases of Ludwig's angina only those should be included in which the patient is desperately ill, sometimes fighting so hard for breath that emergency tracheotomy is indicated even before any attempt is made to release the tension in the neck.

In a review of the reported cases he finds that the etiological factor is the extraction of the lower molar or posterior bicuspid teeth in 8 per cent of the cases. He finds that the bacteriology of the disease corresponds to the organisms which are found in the tooth pockets both before and after extraction of the teeth. Therefore he recommends that if the gums or teeth to be extracted are badly involved in an infection, it may be wise precaution to develop in the patient a concentration of sulfanilamide in the blood adequate to prevent further spread of the infection. He believes that this drug has distinct place in the field of prophylaxis in the extraction of teeth in infected fields. Sulfanilamide may also be employed as a fine powder placed in the tooth pocket after the extraction. If anaerobic bacteria are asso-

erated the use of zinc peroxide has been found to be valuable. Anatomically, he has found that the mylohyoid muscle is of great significance in producing the respiratory difficulty. It raises the hyoid bone and thus obstructs respiration.

The author believes that if, after the extraction of a lower molar tooth, a hard swelling occurs under the tongue it is the duty of the dentist to call into consultation the surgeon who may have to open up the neck widely and hurriedly in order to save the patient's life. If the patient's condition is not so desperate as to demand an immediate tracheotomy one of the intravenous anesthetics preferably sodium pentothal can be employed, but even then the tracheotomy set should be handy as these patients sometimes have embarrassment of respiration after the administration of an intravenous anesthetic. Oxygen, carbon dioxide, and coramine should be handy. The employment of helium in association with either nitrogen monoxide or ethylene, has not yet reached the stage of practical application. Certainly if tension is to be relieved in these cases more done, for as a rule very little pus will be found. The necrotic and gangrenous material should be removed. Some authors advocate the routine removal of the submaxillary gland, but this should not be done unless the gland is involved in the inflammatory process or is interfering with drainage. Care should be exerted to prevent the dissection from extending through the mucous membrane into the mouth. The incision should start at the angle of the jaw about 1 cm from the border and continue to the chin. If the infection is bilateral this incision should continue in the same manner on the opposite side. It should continue through the deep cervical fascia to the muscles of the mylohyoid muscle. When the fibers of this muscle are reached they should be cut transversely. The anterior belly of the digastric muscle should also be cut transversely. By the cutting of these muscles in this manner the pull on the hyoid bone is released, which is not the case with any incision which enters the deep structures by merely separating the fibers of the mylohyoid muscle. The relief is obtained in the cases occurs almost immediately and before the incision extends to the involved tissues beneath the skin. It is a life saving procedure and this consideration should be given to the possible appearance of the scar after the patient's recovery. The incision is protected with a rubber band and over a rubber band a freezed till drum is placed. This is of the size to be done later to remove the appearance of the scar.

WILLIAM C. BLACK, M.D.

the faucial tonsils may be taken as representative of the treatment essential for other small areas of lymphoid tissue with similar involvement. Thus, acute follicular tonsillitis is representative of the commonest form of acute lymphoid infection. Its treatment consists of two parts, systemic and local measures which are well known.

In peritonsillar abscess or quinsy, a localized collection of pus in the supra tonsillar space. During the preliminary period in which an abscess may be forming, incision and drainage are contraindicated. The ideal therapy consists in relief of pain by sedation and by hot saline irrigations within the throat. Once existence of a peritonsillar abscess has been established by the clinical signs such as trismus, a point of maximum induration or suggestive fluctuation above the point of juncture of the anterior and posterior pillars, surgical drainage is indicated. It is advisable to institute drainage under local cocaine anesthesia. A long-handled knife is carried directly posterior at a point just above and median to the superior pole of the tonsils and directly through the soft palate tissue. The knife is carried inward for a distance of from 1 to 1.5 cm and then withdrawn. If an abscess is present, there will shortly follow a thin trickle of yellow pus. A hemostat is next introduced and quickly and vigorously opened to permit a further gush of pus. Thereafter, hot saline irrigations for one or two days will lead to prompt relief. Subsequent tonsillectomy, at a future date, is advisable.

The treatment of acute retropharyngeal abscesses is entirely surgical. Richard prefers drainage with the patient in the supine position, the head extended over the end of the table and the operator sitting at the patient's head, facing his feet. With the anterior wall of the abscess exposed by direct illumination a long handled knife can be passed into the abscess cavity. Pus is manifested by a trickle of yellow fluid from the point of incision. In much the same manner as in the case of peritonsillar abscess a hemostat is used to divide the edges of the wound.

It is important to bear in mind that a but possible secondary hemorrhage. Once such a hemorrhage has occurred with temporary cessation it is the part of wisdom to proceed at once with ligation of it lest the common carotid artery and possibly one of the external carotid arteries and possibly a main primary hemorrhage. Neglect of a greatest risk to the patient's life.

The ligation of a foreign body is a common procedure.

of the esophagus are usually not visible on direct inspection. Much will depend on the history given by the patient. Removal is indicated, usually by the direct esophagoscopy method.

JOSE D. FARRICA, M.D.

De Moro Guerra, C. J. *Remarks on 30 Cases of Amygdaloid Cyst Treated Surgically* (Comentarios sobre treinta casos de quistes amigdaloides tratados quirúrgicamente.) *Seminario médico* 920, 47-79.

The author deplores the fact that amygdaloid cyst is the object of erroneous diagnosis and treatment in many patients for months and even years, when simple puncture and microscopic examination of the obtained fluid could easily settle the question. A drop of the fluid is spread on a slide and stained as if it were a drop of blood. It shows masses of large epithelial cells having a diameter of from 40 to 50 microns and a large protoplasm which is slightly basophil, at times hyaline and at other times finely granular or completely vacuola. The contour of the protoplasm is polygonal when the cells are close together and round when they are isolated. The nucleus is small, central, and has compact or a finely granular chromatin.

Amygdaloid cyst, which is also called branchioma, branchiogenic cyst, and pharyngeal cyst of Chevers, is frequently diagnosed as tuberculous adenitis, studied and treated as such, but naturally without results. In the 30 cases treated by the author the age of the patients varied from fourteen to forty six years in the males and from ten to thirty-eight years in the females. One of the patients had bilateral fibrocystic pulmonary lesions and pleurisy, nevertheless, his cervical process was distinctly non-tuberculous and the condition was proved to be an amygdaloid cyst. In 5 of the 30 cases, the cyst was located under the sternio border of the sternocleidomastoid muscle (upper carotid region) and in the case it presented posterior localization. The process develops insidiously without the slightest interference with the general condition of the patient, without febrile reaction, and without involvement of the skin; therefore the patient usually comes under observation when the cyst has already acquired considerable size. However, sometimes the cyst develops rapidly and the accumulation of fluid under pressure inside of the cavity causes pain. Its relation to the ganglions of the carotid region may give rise to reactions of inflammatory type which may produce the impression that the swelling is going to open spontaneously. In these cases the intervention must be delayed until the inflammatory signs have subsided, even when the diagnosis has been established by puncture. It is well known that lymphoid tissue is very sensitive to roentgen rays, therefore three or four irradiations are given and the intervention can then be performed in non-inflamed tissues.

Excision of the cyst is simple; the author has used the technique of A. J. Paikowsky who approaches the cyst through a transverse incision of the skin and a vertical incision of the fascia. He has never found it necessary to cut the sternocleidomastoid muscle or to sacrifice any important cervical elements. Evidently the technique must be adjusted to suit the individual case. Lately the author has adopted the habit of making a small counter opening 1 cm. below the incision, which is completely closed at the end of the operation; the opening serves to accommodate a small rubber drainage tube which is removed on the fourth day. The reason for using the drain is that always or nearly always, some blood or serosity accumulates in the wound in spite of the most careful ligation of the small vessels. In case the amount of fluid present made it necessary to reopen part of the incision. Six cases are described. RICHARD KREYER, M.D.

NECK

Davis, A. C., and Howell, L. P. *Medical Management of Diseases of the Thyroid Gland.* *Med Clin North Am* 919, 24-99.

Except in diffuse colloid goiter and the hypothyroid states the treatment of thyroid disease usually requires the consideration of surgical intervention. The latter is the procedure of choice in all cases of hyperthyroidism and in selected cases of adenomatous goiter without hyperthyroidism, carcinoma of the thyroid gland, and thyroiditis.

Diffuse colloid goiters of any appreciable size occur rarely after the second or third decade of life. They are most common in adults during pregnancy. They are mainly if not entirely the result of the morphological response of the thyroid gland to an inadequate supply of iodine. The gland usually responds to the use of iodine by diminishing in size. If adenomatous goiters without hyperthyroidism contain relatively large amounts of colloid, some diminution in size may follow the ingestion of iodine but the adenomas remain. Iodine does no good in these cases and therefore it should not be used. There is no curative medical treatment.

We give iodine in the form of Lugol's solution, drops three times a day for several days, in the pre-operative treatment of adenomatous goiter with hyperthyroidism, for two reasons. First, the routine use of iodine will protect the patient against unexpected exophthalmic goiter and all of its attendant dangers. Secondly, in some of these cases, it seems to exert a beneficial effect on the disease.

Auricular fibrillation is the most common arrhythmia associated with hyperthyroidism. Unless congestive heart failure is present the auricular fibrillation rarely requires special pre-operative treatment. Auricular fibrillation alone should never be a contraindication for thyroidectomy.

Auricular flutter is encountered infrequently. If this arrhythmia persists after several days of rest and iodization, the use of quinidine to stop the flutter must be considered before proceeding with thyroidectomy. If it is considered unwise to give

Extirpation of the cyst is simple; the author has used the technique of A. J. Paikowsky who ap-

The medical management of carcinoma of the thyroid is limited to diagnosis. The treatment is primarily a surgical problem.

For the non-suppurative type of acute thyroiditis, the treatment is symptomatic. The compound solution of iodine is administered, however as some degree of hyperthyroidism is usually present. The application of heat would seem likely to encourage resolution but the patient is usually more comfortable with ice collar. When suppuration can be demonstrated, prompt drainage is indicated. This is usually followed by rapid relief of the symptoms, and healing is usually rapid and complete. There is little danger that thyroid insufficiency will develop following acute thyroiditis.

Howie, T. O.: Tuberculosis of the Larynx in Childhood. *J. Laryngol. & Otol.* 44, 55-56p.

Tuberculosis of the larynx may be present in child without giving any signs or symptoms. It is only by systematic routine examination that definite diagnosis can be made.

This report deals with a group of 59 children between the ages of four months and sixteen years. These patients had been under treatment for periods varying from six months to seven years. Of these 59 patients, 50 revealed the presence of tubercle bacilli in the sputum or after stomach lavage. Thirty-eight of these patients showed tuberculous laryngeal lesions. Only 3 of the last did not reveal bacilli in the sputum or after lavage.

The first thing that stands out is the almost constant appearance of open tuberculosis in the cases showing laryngeal involvement. The frequency was 38 of 4 cases. Bovine and human infection seem equally prone to produce laryngeal disease. Most of the disease occurs in cases showing cavitation and bronchopneumonic lesions in the lungs.

Signs and symptoms in the early stages of the disease are seldom present. The child makes no complaint of discomfort or pain and it usually is not hoarse. A patient suffers from dysphagia.

The lesions found varied in types. Some of them consisted of slight thickening of one cord and others of extensive destruction of the larynx with perichondritis and fetid breath. The most common site of the lesion was in the posterior part of the larynx and the interarytenoid area and on the posterior extremity of the cord. The disease usually began with thickening of the interarytenoid area. This was followed by destruction of one or both cords and if some of the lesions progressed to tubercular papillomatosis. In patients this outgrowth sloughed off and left an extensive area of destruction. One case showed typical turba epiglottidis.

Treatment has been found difficult because it is not possible to enforce absolute silence upon children. One must be content with whispering. In all cases an inhalant of creosote was used. A local application, ultra-violet irradiation, nor electric cauterization was used in these children.

J. D. DR. W. L. LUNA, M.D.

conditio and every fat boy with delayed development does not have a craniopharyngioma which is destroying his pituitary gland. If let alone, most of these fat boys straighten out themselves and most of the cures reported following the use of endocrine preparations probably would have occurred if no treatment had been given.

We wish to emphasize that (1) Simmonds disease is an entity (2) it is extremely rare (3) many of the patients reported to be suffering from Simmonds disease really have anorexia nervosa, and (4) therapeutic response is poor basis for diagnosis.

There is no evidence to indicate that gigantism and acromegaly are essentially different. Both are caused by the excessive production of the growth hormone from a tumor or hyperplasia of the eosinophilic cells. If this condition develops before the ossification centers are complete, then gigantism is produced. If the excessive output of the hormone occurs after the ossification centers are complete, the resultant deformity is called acromegaly. This condition is characterized by overgrowth of the short and long bones, enlargement of the viscera, changes in the muscles, and hypertrophy of the ligamentous connective tissues.

Both acromegaly and gigantism may burn out spontaneously possibly as the result of cystic degeneration of the tumor. Even patients with progressive disease may go on satisfactorily for many years. Death may be produced by intercurrent infection, the final cachexia of the disease, congestive heart failure without hyperthyroidism, or the pressure effect of large tumor. Formerly diabetic coma accounted for a fair percentage of the deaths.

Treatment of gigantism or acromegaly is unsatisfactory. The surgical removal of the responsible

tumor is advised only when detailed examination of the visual fields gives evidence that blindness is likely to ensue. Numerous reports regarding roentgen treatment have been published, some of which give an account of careful studies and encouraging results.

The clinical syndrome known as pituitary basophilism, or Cushing's syndrome may be associated with hyperfunctioning adenoma composed of basophilic cells. The syndrome is not specific and is limited to basophilic adenoma of the pituitary gland.

The diagnosis of Cushing's disease is always fraught with uncertainties, and it should never be made until the other diseases which may be associated with Cushing's syndrome have been excluded. In doubtful cases the adrenal glands and pelvic organs should be explored surgically and efforts made to exclude thymic neoplasms.

Treatment is not very satisfactory. Roentgen therapy has been used with considerable success in isolated instances.

Although the function of the posterior lobe is not known definitely, experimental and clinical evidence suggests that it probably (1) controls the flow of urine and thereby regulates water balance (2) influences the carbohydrate metabolism, and (3) has something to do with the onset of parturition.

Not every patient who drinks large quantities of water and voids excessive amounts of urine has diabetes insipidus. For many individuals this is a manifestation of neurosis. The differential diagnosis can be made by testing the ability of the kidney to concentrate urine.

Treatment for diabetes insipidus obviously consists of replacing the hormone which by its lack causes the disease.

NON-TUBERCULOUS THORACIC EMPYEMA

A Collective Review of the Literature from 1923 to 1930

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ACTH thoracic empyema has in the past years been a pressing problem of many surgeons and in the past few years much has been written about it. Although the term "empyema" of the pleural space has been used by Quain, Bland, and others, it is not clear that any one of the authors has been able to place it in its proper perspective. The term "empyema" is a Greek word which means "a swelling" and is used by Hippocrates to describe a swelling of the pleural space. The term "empyema" is used by Quain to describe a swelling of the pleural space. The term "empyema" is used by Bland to describe a swelling of the pleural space. The term "empyema" is used by others to describe a swelling of the pleural space.

It is perhaps a pity that the only "text" of statistics dealing with this exact disease is that method of treatment since it is not the physician's job to make efforts to cure a patient's disease. Allen and others have concluded that each case must be considered separately. However, from what has been said, it is not clear that one can be definite. It is not clear that one can be definite of the value of the principle of treatment by the Freyer-Carmichael-Sutton method of treatment the principle of treatment.

Among the details that surround the principle is the problem of what this disease shall be called. Suppurative pleurisy and parietal pleuritis have been offered as more exactly describing the pathological process that takes place, doubtless the terms are more accurately descriptive. Empyema thoracis, thoracic empyema, and pleural empyema are advocated as more accurately defining the location of the pus, and this, too, is true. However, for the purposes of simplicity and for the avoidance of word and construction, I prefer the word "empyema" defined only as "acute" or "chronic" when that modification is necessary. Tuberculous empyema is a distinct entity with diagnostic and therapeutic problems quite different from those that attend non-tuberculous pleural infection.

INCIDENCE

It is difficult to determine accurately how many cases of empyema occur. It is not a reportable disease nor is it listed as a cause of death. White

has reported a rate of 17 cases from all the hospitals of Washington, D.C. in a report which covered five years. Since the population of Washington is over half a million, the rate of occurrence is very high. However, 11 of the 17 cases died, and 5 of the 11 died before death, even though the patients were in hospital, so it is obvious that a fair number of patients died of empyema without even being admitted to a hospital for diagnosis and treatment. Gerhous reported 12 cases in 15 admissions to the Children's Hospital in Philadelphia. The incidence of this disease is one percent. One conclusion to be drawn from the figures is that the average physician should be fairly well versed during his life, and that a few specialists will see many.

ETIOLOGY

Empyema is rarely a primary disease. It is more frequently secondary to pneumonia or infection. However, there are other causes. Pulmonary abscess frequently causes a distressing type of empyema. Neufeld and Hirschfeld found that putrid empyema due to the perforation of a pulmonary abscess occurred in 17 of 184 children with empyema and in 25 of 100 consecutive cases of abscess of the lung. Among 55 cases of pulmonary pyothorax studied by Kline and Berger empyema occurred in 6. Michelson found 38 cases of putrid empyema among 1450 cases of empyema in children. Penetrating wounds of the chest when occurring in civil life are only seldom the cause of empyema. Steinkamp found that it occurred in only 3 of 87 such wounds. Bronchiectasis may occasionally cause empyema by the perforation of a bronchiectatic abscess into the pleural space. This danger is considerably augmented by the use of pneumothorax in the treatment of bronchiectasis.

Stenberg, Charl, and De la Chapelle have called attention to 4 cases of empyema which followed sterile pulmonary emboli and thrombosis, they believe that secondary infection of the pulmonary infarct through a bronchus produced suppurative pneumonia and empyema. Wolfe had a case of empyema which was caused by the metastasis to the lung of a malignant thyroid

adenoma. Empyema may also be caused by primary pulmonary tumors which have obstructed a bronchus. Prolonged bronchial occlusion is invariably followed by suppurative in the portion of lung drained by that bronchus and perforation into the pleural space may then occur. The perforation of a subdiaphragmatic abscess or a perirenal infection into the pleural space is another cause of empyema (Harrington, Zeffm). Lane's interesting case, in which the bacillus typhosus was found in the pus, occurred forty years after an acute attack of enteric fever and was thought by him to be secondary to typhoidal otitis of a rib.

Intrathoracic operations may be a cause of empyema. The introduction of a needle into the pleural space for the aspiration of sterile fluid, in the course of pneumothorax treatment, or to obtain an aspiration biopsy may result in empyema either by the implantation of organisms from the exterior or by injury to the lung. Infection of the pleura may also occur subsequent to perforation of the esophagus. Septicemia is very rarely a direct precursor of empyema.

Nevertheless, pneumonia and influenza are preponderantly the cause of empyema and this is true particularly in children. Burpee found that 80 per cent of his cases were caused by pneumonia and 7 per cent by influenza. This ratio would doubtless change if another epidemic such as that of 1918 should occur. Empyema occurred secondary to pneumonia in 94 of Lloyd's 104 cases, 96 of Mason's 103 cases, 335 of Steinko's 459 cases, and 189 of Tanner's series of 207 cases. In Michalowski's series of 1,450 collected cases of empyema in children, pneumonia was indicted as the cause in 63 per cent and in a further 20 per cent the empyema followed infectious diseases or exanthemas. In many of the latter cases it is reasonable to suppose that pneumonia was the direct intervening cause.

On the other hand, only about one tenth of the patients with pneumonia develop empyema. Ashby says between 10 and 2 per cent. Hurwitz and Stephens found that empyema occurred in 9 per cent of 639 cases of pneumonia in children under twelve years of age. Maes, Veal and McFetridge reported that during a ten-year period there were 6,056 cases of pneumonia in the Charity Hospital and in 1.2 per cent of these empyema developed. They believe that the incidence after influenza is slightly less unless the influenza is epidemic. Penberthy and Benson had 407 cases of empyema among 5,863 cases of pneumonia in the Children's Hospital in Detroit, an incidence of 7 per cent.

It is to be expected that the more widespread use of sulfapyridine and sulfanilamide will cause a con-

siderable reduction in the number of patients with pneumonia who develop empyema. Schwartz, Flippin, and Turnbull studied 351 patients with pneumococcal pneumonia and found that of the group that was treated with type-specific serum 10 per cent developed empyema, whereas of those who were given sulfapyridine only 2.3 per cent subsequently had empyema. Thorupson, Edwards, and Hoggland have reported 121 cases of pneumonia treated with specific antiserum, 12 of the patients developed empyema. Of 142 patients treated with sulfapyridine only 4 had empyema. Doubtless many others who use sulfapyridine in treating pneumonia will have similar experiences.

Since about 80 per cent of empyema is caused by pneumonia, it is reasonable to suppose that the pneumococcus, streptococcus, and staphylococcus are the organisms most frequently found in empyema. In about a score of papers the causative organism has been determined in a sufficiently large number of cases to be significant. Bacteriological examination of the pus was carried out in about 3,000 cases collected from the literature of the last five years and the pneumococcus was found in 63.9 per cent, the streptococcus in 9.4 per cent, and the staphylococcus in 6.5 per cent. Combinations of pneumococcus, staphylococcus, and streptococcus were much less frequently found and the influenza bacillus was only very occasionally the mischief maker. Chatterjee reported of 23 cases to be due to the bacillus influenzae Harloe of 35 cases, and Wallace 1 of 363 cases.

Other organisms are found so rarely as to be curiosities and are reported as such. Bingard reported 2 cases of actinomycotic empyema; the patients have remained well sixteen and twenty six months after several operations. Brunner had 3 patients with empyema due to the fusidiform bacillus each recovered after drainage and the administration of neosalvarsan. He believes that the prognosis in such cases is good because of the tendency toward early encapsulation. Lane and Francis treated a patient with empyema due to the typhoid bacillus and Harloe had in his series of 351 cases. Carnazzo reported cases due to the colon bacillus in his group of and Mason found that in a series of 93 were due to this organism. Greavillius and Quarril have recorded the case of a child of eighteen months with empyema due to the bacillus megatherium the child recovered completely after rib resection for drainage.

The fact that these organisms may cause empyema is of importance because of the diagnostic hurdles such bizarre bugs may place before one.

MacDonald had a patient with empyema in whom drainage was long delayed because the pus was at first sterile on routine cultures. Quite proper reasoning led him to delay drainage because the failure to demonstrate a pyogenic organism occasioned the belief that the infection was due to the tubercle bacillus. Subsequently a pure culture of *brucella abortus* was grown from the pus, after drainage the patient's recovery was complete.

Most curious is the case reported by Zwirn, Joyeux, and Aboucaya, their patient was a thirteen-year-old girl who developed empyema subsequent to an appendicectomy. When the chest was opened for drainage an adult male worm, identified as *ascaris lumbricoides*, was found in the pus. The worm was dead and had ingested a large amount of pus. Subsequently the patient developed pericarditis and pulmonary edema and the bacillus coli was found on blood culture. Examination of the stools revealed eggs of the *ascaris* and the trichocephalus. Vermifuges were given and the child recovered after a prolonged illness. The authors have found 10 similar cases in the literature. It is not clear how the worm entered the pleural cavity but its presence there may have been the result of direct perforation of the intestine through the diaphragm or through the liver, or, most likely, of aspiration of the worm from the pharynx into the lung and subsequent perforation of the pleura.

empyema. In 2 of the patients thoracotomy was performed and at operation it was found that the pus was intrapulmonary rather than intrapleural. Shaw believes that the paucity of the amount of pus that can be aspirated and its thick mucoid character should arouse suspicion that the pus comes from within the lung. In such circumstance a futile thoracotomy may occasionally be done. It is preferable, I believe, occasionally to perform an unnecessary but harmless operation than to neglect to do an essential one.

It is important that the diagnosis of empyema should be made early, since treatment, consisting of the complete and rapid evacuation of pus, should begin early in order to save the patient from the distressing physical and systemic effects of untreated infection and in order that the post-operative course will not be unnecessarily prolonged. Fitzgerald has emphasized that delay in operating in acute empyema is dangerous if the functional value of the lung is to be maintained. Horne and Baker carefully studied 103 cases of empyema in children less than thirteen years of age in order to determine the influence of the duration of illness prior to treatment as a factor in empyema complications as well as a factor to be considered in the reduction of mortality. Irrespective of the type of operation, in this group there were 16 deaths and 15 deaths occurred in children who had . . .

accurate information about intrathoracic conditions than will one too imperfect senses. Roentgenograms in frontal and lateral planes will almost invariably demonstrate even small amounts of intrapleural fluid and if properly interpreted, will provide accurate information as to its whereabouts. It is a simple matter to insert a needle and remove pus for examination in order to determine its physical and bacteriological characteristics. Oldberg believes that even with roentgenograms alone one may distinguish between pus and a serous effusion. The practical value of this differentiation by means of roentgenograms is doubtful.

Piot strongly objects to the fact that the roentgenologist is too closely attached to his laboratory and argues that it is only by taking roentgenograms at the patient's bedside early in the disease while he may still be too ill to be moved, that a prompt diagnosis can be made. If pulmonary abscess or encysted or interlobar empyema occurs, Piot believes that only in this way can a satisfactory differentiation be made before perforation into a bronchus occurs.

Duplant also believes that only by early and repeated roentgenological examinations can the diagnosis of interlobar empyema be made before it is suggested by a sudden vomiting treatment before perforation into a bronchus may be effectively carried out.

Thomas states that roentgenograms should be made in all cases of empyema before operative treatment is undertaken, and aspiration of pus should be done only after the diagnosis has been made and then only as a prelude to operation or therapeutic aspiration.

Suitable roentgenograms taken in anteroposterior and lateral and, if necessary, oblique projections provide an accurate means of localization of pus prior to aspiration. Definite localization is of particular importance when diagnostic aspiration of an encysted empyema is to be attempted. Certainly such a procedure would save many a patient the distressing experience of the 70 times in 70 places aspiratory attempts advocated by Oiler when empyema has been suspected. I believe that the importance of roentgenograms in the diagnosis of empyema cannot be overestimated and, certainly roentgen examination should never be omitted before operation.

Aspiration remains the final and, in fact, the only definite means of diagnosis. The evaluation of clinical signs and symptoms and the interpretation of roentgenograms may all be misleading. A thick pleura, pulmonary infiltration or fibrosis, solid tumors, and fluid filled cysts may produce physical signs and roentgenographic appearances

that are similar to those of empyema. Pulmonary atelectasis, since it causes mediastinal and tracheal deviation toward the affected side may thereby be differentiated from fluid or pus in the chest because the latter most frequently pushes the mediastinum toward the opposite hemithorax. It is true that in rare cases the aspiration of pus from within the thorax may not mean empyema but such cases as those described by Shaw infected pulmonary cysts or tumors, and the transpleural aspiration of pus from a subphrenic abscess are rare indeed. The actual demonstration of pus is of importance in determining the presence of empyema. Its site, the nature of the infecting organism, and the physical characteristics of the pus. However aspiration of purulent fluid may in itself be misleading. Graham, Slinger and Ballou state: "It is perhaps advisable to call attention to the fact that nearly every case of acute pneumonia will reveal some fluid in the pleural cavity if an aspiration is performed. This fluid is serofibrinous or serohemorrhagic. Even though leukocytes and bacteria may be found in it on microscopic examination, it does not indicate an empyema in the sense of a true abscess. In most cases this fluid will be absorbed as the pneumonia clears. Statistics, therefore based on the recovery of such patients after aspiration or continuous closed drainage are often misleading." Michalowicz has demonstrated that in children who are perfectly well aspiration in the diaphragmatic sulcus will usually be productive of a few drops of fluid which contain a small number of what seem to be pleural endothelial cells. He has found that in children with lobar or lobular pneumonia the pleural effusion passes through several forms: (1) yellow or slightly cloudy fluid containing a more or less considerable number of endothelial cells (2) cloudy fluid containing endothelial cells as well as a small number of hite blood cells, particularly lymphocytes (3) cloudy sterile fluid containing polymorphonuclear leucocytes (4) infected cloudy fluid containing polymorphonuclear leucocytes as well as pathogenic microorganisms and (5) purulent fluid. The development of such an effusion the metamorphosis to frank empyema may stop short of the final stage of purulent fluid.

Olsen and Hansen have developed a method for the recognition of empyema in its earlier phase when the pleural exudate is still serous or only slightly turbid. The cells from the exudate are stained by a supravital staining method that differentiates between living leucocytes, which absorb neutral red in their granules, and dead ones, which cannot be stained by this method. In

open drainage can be performed safely. Mason found that in children the proper time for drainage was approximately eighteen days after the onset of pneumonia.

Underlying these methods for determining the proper time for doing a rib resection for empyema is the principle of avoiding an open pneumothorax in the early stages of the disease. Fixation of the mediastinum and localization of the pus to a definite, walled-off abscess are essential to the safe performance of rib resection, and essential to a slightly lesser degree to the safe performance of closed intercostal drainage. Although I have had no experience with the method proposed by Beriman, it is probable that fluoroscopic determination of mediastinal fixation, when correlated with the physical characteristics of the pus, will provide valuable information concerning the proper time for drainage. However fluoroscopic observation and interpretation of the findings requires considerable experience and familiarity with intrathoracic dynamics.

Empyema does not always conform to the pattern that is expected. In location the pus is usually found in the lower thorax, but it may be loculated in any part of the pleural cavity. Kauts and Pinner have reported 3 cases of peripneural empyema. In each case the diagnosis was proved by post-mortem examination. They have been able to find no similar cases in the literature. The diagnosis should be suggested by the clinical course and confirmed by roentgenograms which are indispensable in such cases. Aspiration of pus and subsequent surgical drainage can be readily done after localization by means of anteroposterior, oblique, and lateral roentgenograms.

The pus from empyema, if not drained surgically, may burrow in many directions. Perforation into a bronchus or the development of empyema necessitatis are the most common means of spontaneous drainage. Perforation into the trachea, esophagus, pericardium, blood vessels, or mediastinum may also occur. Occasionally the pus may penetrate the diaphragm to the peritoneal cavity or extraperitoneally. Deane has described a case of empyema on the left side which was unrecognized for three years. Eventually the pus presented in the left loin with signs similar to those of a perinephric abscess.

Blauvelt has reported a patient with empyema in which perforation of the esophagus occurred after drainage by thoracotomy. He has also found 8 similar cases in the literature. In these cases treatment has been varied: gastrostomy feeding through a Rehfuess tube and simple drainage of the empyema. If the fistula persists after

drainage closure through the thoracic wound might be feasible. Knauser has reported a case similar to Blauvelt's.

Renck has had an unusual case in which perforation occurred to the opposite pleural cavity through a communication at the level of the fourth rib. At autopsy the perforation was disclosed and mediastinal herniation was ruled out.

Burch has added still another route which pus from empyema may take. In his patient the pus infiltrated through the vertebra into the spinal canal and caused paraplegia. There was some doubt in this case as to whether the empyema preceded the suppurative myelitis, whether the opposite sequence occurred, or whether both conditions started simultaneously as part of a septicemia.

Empyema may have serious effects upon contiguous structures. Dickinson has recorded a case of eventration of the diaphragm following drainage of empyema on the left side. The diaphragm was simply in a very high position but there was no true herniation. The patient's symptoms of pyloric obstruction were relieved by suture of the stomach to the anterior abdominal wall in a lower position. Parsons has reported the herniation of the stomach through the diaphragm in an area which had been weakened by empyema two years before. The diaphragmatic opening was closed by means of linen sutures.

Hill had a patient who, three weeks after drainage of an empyema on the left side, noticed that his left hand, arm, axilla, and shoulder did not sweat and that these portions of his body were hot and dry. This condition persisted for about one month. Hill believes that there was some disturbance of the thoracic sympathetic trunk where it lies in proximity to the parietal pleura and that the disturbance was caused by the contiguous empyema.

TREATMENT

Any consideration of therapeutics in empyema should stipulate what is to be accomplished. The first aim should undoubtedly be to save the lives of those individuals who might otherwise die of the disease. Secondary to this all important result are (1) complete evacuation of the pus (2) rapid elimination of toxicity and systemic effects (3) sterilization and subsequent complete closure of the cavity with obliteration of all foci of infection (4) complete healing of the external wound (5) restoration of the normal respiratory function of the lung (6) restoration of the patient to his normal social and economic position (7) the avoidance of chronic empyema and recurrences.

and (8) the accomplishment of all these desired results in as short a time as possible. Any method of treatment should be evaluated primarily by these criteria. Further evaluation of the method should concern its applicability to most types of empyema, the extent of its adaptability to the varying talents of physicians and surgeons, and its demands upon the time, patience, and skill of the nursing and professional personnel under whose care the patient will be. The latter factors will render a method absurdly impractical in an understaffed rural hospital while it may give brilliant results in a highly organized clinic in which the attending personnel outnumber the patients. Furthermore, I believe it is true that the average surgeon will operate on very few patients with empyema in the course of any year. The method of drainage to be used, therefore, should be one that will not too strenuously tax the memory and capacity of the assistants and nurses in providing the extremely important proper postoperative care, since when cases are few the necessities of postoperative care will not have become familiar through repetition.

In short, the simplest method that will produce the desired results is undoubtedly the best one.

With these requirements for satisfactory treatment in mind, we can consider the methods that have been proposed to achieve them. Differences of opinion have established two main schools of thought—the open method of drainage and the closed method. Seemingly, the cleavage between the proponents of the two methods is as definite as that between the Big Indians and the Little Indians of Lilliput. (The aim of each of the quarrelsome factions in Swift's tale was to get at the egg and they differed only in the proper approach.)

It has long been customary to denote as "closed" those methods of treatment that rely upon the introduction of a catheter into the empyema cavity in such a manner as to prevent the exposure of the pleural cavity to atmospheric pressure. On the other hand, "open" methods, such as rib resection or the removal of a portion of an intercostal muscle bundle, allow more or less free ingress of air even if only momentarily at the time of operation. Strictly speaking, aspiration of pus by means of a needle and syringe is a "closed" method of treatment, but it is better to consider it apart from surgical methods.

The fundamental principles of the treatment of empyema cannot be reiterated too often, particularly since in recent years there seems to have been a tendency to attempt to achieve by so-called "conservative measures" what can be done

satisfactorily only by prompt and adequate surgical intervention. Graham states as follows: "Two principles in the treatment of this condition (empyema) seem now to be firmly established, of which one is that empyema is essentially a surgical disorder demanding surgical drainage in nearly all cases. The other principle is that open drainage during the developmental stage is fraught with so much danger to the life of the patient that it should not be undertaken. Until the time comes when specific therapy against the infecting organisms is at hand it seems probable that these two principles will stand. They were recognized empirically by Hippocrates but because the underlying rationale of them was not understood until the period covered by the last two decades they were largely lost sight of. The terror of the epidemic which afflicted the United States Army camps in 1917 and 1918 was increased by the fact that many needless deaths occurred because the surgeons believed that early open drainage should be induced even before the inflammatory reaction had developed into an abscess. We now know that empyema in itself rarely causes death. The deaths which occur are due almost entirely to the pneumonia of which the empyema is only a complication or to the unwise creation of an open pneumothorax for drainage purposes during the period of active pneumonia. The particular danger to the patient lies in the fact that at that period of the disease his vital capacity may be only slightly greater than the tidal air requirement. The danger of death from asphyxia is therefore very great if the respiration is embarrassed still more by the presence of an open pneumothorax. Various improvements in the technique of drainage and in other particulars which have been introduced in recent years are distinct advantages. Closed drainage, to mention only one, is one of them. These matters, however, are essentially details."

Closed drainage (usually the insertion of a catheter between the ribs) was developed to circumvent the disasters that resulted from opening the thorax in the acute stage of empyema before the mediastinum had become fixed and perhaps before the underlying lung had recovered from pneumonia. At present all agree that open drainage should not be instituted until fixation of the mediastinum has taken place.

The groundwork of therapy would be incomplete without consideration of the possible terminations of an empyema that has not been treated. Most obvious, of course, is the death of the patient from toxic exhaustion or metastatic foci of infection. Graham, as quoted, and Heuer

believe that empyema, in itself rarely causes death, but a fatal outcome may result from complications of empyema. I cannot agree with this belief. The simple presence of pus within the thorax may certainly be fatal. Miles, Veal, and McFetridge have studied the records of 60 patients who died with empyema and found that in 40 of these the cause of death was only toxicity and subsequent exhaustion. Michalowitz believes that there are three other possible outcomes, and among 1450 cases he found that external perforation with the development of empyema necessitatis occurred in 13 and internal perforation with complete or partial evacuation of the pus through a bronchopleural fistula occurred in 19 cases. The third possible eventually spontaneous resorption, did not occur in any of these cases.

Recovery from empyema may be spontaneous or at least it may occur without the physician's assistance in evacuating the pus; however this occurs very rarely. Bowen reported 3 patients who recovered after spontaneous drainage through a bronchopleural fistula. Hartfall and Pyrah have treated a patient with two distinct empyema cavities, one of these in the posterior subapical region, was cured after drainage by rib resection; the other pocket was parameasternal and closed after spontaneous drainage through a bronchial perforation. Oetken has reported the complete recovery of a patient with empyema due to the pneumococcus Type XIV; the only treatment was the oral administration of dimethyl-sulfanilamide (abron). Thier and Eck are enthusiastic about the use of sulfanilamide derivatives in the treatment of streptococcus empyema in those patients who are too ill for surgery; they have successfully treated 3 such patients with the chlorhydrate of sulfamido-chrysoidine (ribiscol). Further cures without surgical intervention or repeated aspiration of pus have been reported by Tripodi, who successfully treated 3 patients solely by the intravenous administration of a 1 per cent suspension of animal charcoal. Pontieri, in analyzing 70 cases of empyema in children, found that 3 were treated only symptomatically and with the administration of an autovaccine; these were patients in whom the pus was not readily accessible (interlobar or mediastinal) or in whom repeated aspirations failed to demonstrate pus despite clinical and roentgenological evidence of its presence. Four of these 3 patients died. It is fair to inquire how many more drained through a bronchopleural fistula and in how many of the not proved cases the diagnosis can be accepted. Mindful of the fact that many conditions in which there is not even pus may be miscalled empy-

ema, it is well to view with scepticism such reports of recovery without the evacuation of pus.

With a jaundiced eye one reads Burrell's case report of a boy who developed empyema from which a sample of cloudy slightly purulent, yellowish liquid was aspirated. It was sterile but contained pus cells and a large number of polymorphonuclears. No tubercle bacilli were found. No further aspiration was performed but the boy made a complete recovery. I doubt that such a case can be considered empyema.

Lester's experience with chemotherapy in empyema has been quite different. He has reported 4 cases of empyema in children, due to the hemolytic streptococcus; 3 of the patients had prolonged treatment with sulfanilamide, prontosil, or both, in doses that should have been adequate, and a definite effort was made to control the disease by means of these drugs and repeated aspirations. However, in all of the cases surgical drainage was necessary to effect a cure. In the fourth case sulfanilamide was used after operation. Lester does not believe that in these cases the empyema was much affected by the drug although the patients may have been slightly less ill than they might otherwise have been.

Brown has cured 3 patients with streptococcal empyema by the intrapleural injection of prontosil. Nicholson, in order to test the efficacy of sulfanilamide, experimented on rabbits with streptococcal empyema. He found that the animals which were given prontosil intrapleurally died earlier and more often had a positive blood culture than those which did not receive the drug. Nicholson thinks it very unwise to use prontosil intrapleurally but recommends its oral use.

The manner in which healing takes place in empyema is of great importance in planning a proper method of treatment. Carlson has experimentally verified Heger's observations that empyema heals by the progressive formation of adhesions between the parietal and visceral pleura. Carlson produced empyema in rabbits by the injection of streptococci and a broth culture of staphylococcus aureus. He found that pus tends to form at the most dependent part of the thorax and that the remaining pleural space usually becomes obliterated by fibrous adhesions. Microscopic sections revealed that both pleural layers were replaced by granulation tissue and that subsequently fibrous tissue grew between approximated pleural surfaces. Carlson believes that the same process takes place in clinical empyema.

Allison agrees that healing takes place by this gradual and steady process of adhesion of the visceral and parietal walls of the empyema. He

thinks further that inequalities in the rate of healing at different points depend on differences of elasticity in the visceral and parietal walls. Ideally, healing should progress centripetally with the drainage point as a center. Since proper allowances for anatomical readjustments should be made, he thinks that before the drainage site has been decided upon, as much pus as possible should be aspirated and a very small amount of air injected. Roentgenograms should then be made to determine the shape, position, and size of the cavity after the relief of pressure within it. Despite the theory of centripetal progression of the "healing edge," Allison believes that the proper site for drainage is at a dependent point.

Many methods of treatment of empyema have been proposed. However, they all fall roughly into four classes: (1) the administration of drugs of various sorts, (2) aspiration of pus with or without the introduction of air or chemical solutions, (3) closed drainage in which a determined effort is made to exclude atmospheric pressures from within the thorax, and (4) open drainage by which the negative intrathoracic pressure is not so scrupulously guarded. However, it must be remembered that the apparent distinctions proposed by advocates of the last two methods are not very definite. Thus drainage by rib resection and the insertion of a large rubber tube is certainly, if only momentarily, an open method, but air can subsequently be as successfully excluded from the pleural cavity by this method as by the closed method. And conversely, the careless aspiration of pus by means of a needle and syringe may allow the ingress of just as much air as that which enters during the resection of several ribs.

THERAPEUTIC ASPIRATION

There is no dispute but that aspiration (by means of needle and syringe) as a method of diagnosis is an important and never-to-be-neglected procedure. Of equally great value is the use of repeated aspirations of pus preliminary to operation. By this means toxic symptoms may be alleviated and intrathoracic pressure reduced until such time as the mediastinum has become stabilized and operation may be done safely. Therapeutic aspiration, unfortunately, does not enjoy any such secure position. Although, occasionally, complete and permanent cure may be effected by aspirations which are done preliminary to operation, this is fortuitous. Those who advocate repeated aspirations of pus as the only treatment believe, "No more good can be accomplished by removing the pus through a hole in the chest than by a needle" (Pollack). Perhaps this

is true, but certainly more good can be done by keeping the cavity empty at all times than by emptying it intermittently. They believe that the procedure is to be most recommended for infants, who withstand operation less well than children and adults. This method is less distressing to the patient since he is spared an operation, the discomfort of wearing a tube, and the annoyance of pus-soaked dressings. It is thought by some that recovery is more rapid and the period of hospitalization shorter. On the other hand, there are those who believe that treatment by repeated aspirations holds only a limited—and, indeed, even a questionable—place.

Aguirre is of the opinion that this method should be used only in small and encysted empyemas, and, even in such cases, if four or five aspirations do not effect a cure or a considerable reduction of the toxicity, then thoracotomy should be done. Bohrer believes that aspiration as a curative measure is applicable in only a very few cases. Fitzgerald deprecates as dangerous the delay that may be caused by a futile effort to cure empyema by aspiration. Gezelius, among 159 children with empyema, had 15 who were treated by this method and 10 of these died, however, it is only fair to emphasize that these were the patients who were too ill to tolerate other operative measures. Mihara thinks that aspiration is unsatisfactory. Schneegans seems convinced that it is the best method for treating children. On the other hand, Wangenstein thinks that aspiration with a needle does not provide adequate continuous drainage and that, therefore, it is inferior to other methods.

Proper evaluation of aspiration as a method of treatment should be based upon a comparison of it with the other acceptable methods of treatment in respect to mortality, duration of toxicity, number of failures, and duration of convalescence. Such figures may be obtained from reports of series of cases that have been treated only by this method, and it is to be expected that only those workers who have enjoyed considerable success will deem their results worthy of publication. A second source of information is large series of cases in which many therapeutic measures have been tried. These figures may be misleading since aspiration may have been used only in very ill patients or there may be included, as having been treated by aspiration, patients who died after a few aspirations which would merely have been preliminary treatment had the patients lived. So the statistics are not entirely reliable.

Arnesen has reported 12 cases of postpneumonic empyema treated by multiple aspirations. His

method has been to remove all the available pus and then wash the cavity with a weak aqueous solution of iodine or rivanol. The number of punctures varied from two to seventeen and the duration of treatment from three to twenty-two weeks there were no deaths and apparently none of the patients required operation.

Bilderback and Goodnight have treated 33 children by the aspiration of pus and replacement with air. Of these patients, 9 or 7.7 per cent subsequently had to have closed drainage. In the remaining 23 the death rate was 4.3 per cent and the average hospital stay was forty-two days from the time the diagnosis was made. The average number of aspirations was twelve.

In a series reported by Pontieri and Tedlaric, 23 children were treated by repeated aspirations with 13 deaths, a considerably greater mortality than resulted from closed or open methods of treatment. In large numbers of cases Stedale, Torres, Utter, Wallace, and many others have had similar experiences. Wallace's ultimate conclusion was that treatment by aspiration alone caused more deaths than did treatment by surgical measures and that mortality rates were higher with closed methods of treatment than with rib resection and open drainage, the lowest mortality in his cases occurred among those treated by means of rib resection and subsequent air tight drainage.

On the basis of my own experience and the accumulated reports of others, it is my belief that aspiration with or without irrigations as a sole method of treatment of empyema is much less satisfactory than are surgical methods. Despite a few reports of small series of cases treated by aspiration with no deaths, in general the mortality rates are higher, morbidity is prolonged, and a large number of patients must necessarily be subjected to operation long after the most desirable time for surgical intervention has passed. Paradoxically the so-called conservative treatment is actually more dangerous and less satisfactory than are the surgical measures that carry the qualifying adjective, radical.

The injection of air after the aspiration of pus from an empyema cavity is rather generally done by those who believe that the multiple-aspiration method of treatment is of value. However I think it is undesirable to do so. First of all, the basis of healing of empyema is the formation of adhesions between the visceral and parietal layers of the pleura. If then the pleural layers are kept apart by air adhesions cannot and will not form and healing will be greatly delayed. It is particularly desirable that symphysis between the vis-

eral pleura over the upper portion of the lung and the corresponding parietal pleura should take place early in the disease in order to localize pus at this base. In the presence of a pyopneumothorax air will accumulate in the upper portions of the chest and prevent the formation of desirable adhesions. Another of the reasons for removing the pus is to relieve the pressure on the underlying lung; it does not seem logical, therefore, to maintain the collapse of the lung by substituting a pyopneumothorax for a simple pyothorax. Pus is also aspirated to relieve the patient of respiratory embarrassment and this is not satisfactorily done by maintaining partial collapse. Replacing pus under pressure by air under nearly as great pressure does not diminish the absorption of toxins from the infected surfaces. In fact, there is reason to believe that absorption is thereby increased. Brock found in experiments on rabbits, that absorption through the pleura is greatly accelerated by dyspnea and even more so by inflammation of the pleura. From this he concludes, "The patient who is grossly dyspneic with a large pyopneumothorax and an acutely inflamed pleura is absorbing harmful substances at an alarmingly rapid rate."

One of the reasons for replacing pus with air in therapeutic aspirations is that the operator can thereby more safely remove a very much larger amount of fluid at one time than would otherwise be possible. The need for rather rapid evacuation of the fluid is sometimes pressing because of the patient's dyspnea and because of the need for relieving him of the toxic effects of enclosed pus. This can be done even more safely by removing smaller amounts at more frequent intervals.

Still another objection to the deliberate creation of a pyopneumothorax is that the intercostal pressures may not thereby be reduced sufficiently to obviate the possibility of infected air or fluid being forced out into the chest wall. It is considerably easier for infected air to be forced out of a needle track than for thick pus. Furthermore the introduction of air into an empyema cavity may obscure the subsequent development of a bronchopleural fistula; this is of particular importance in small children, who may raise even large amounts of pus from the airways but promptly swallow it rather than spit it into a convenient container where it may be brought to the attention of the attending physician. Often the only certain evidence of a bronchopleural fistula is the demonstration in roentgenogram of air in the pleural cavity.

Fluid should be aspirated frequently enough so that dyspnea does not occur. It is only in this way

after the resection of a rib as with the use of an intercostal catheter. The open methods of treatment need necessarily be open only long enough for the surgeon at the operating table to satisfy himself that he has provided adequate drainage and that there are no underlying conditions which will impede healing of the cavity.

Closed operations are those in which a catheter is inserted into the empyema cavity through an intercostal space without exposure of the parietal pleura. A trocar and cannula of a size large enough to allow the introduction of about a No. 18 F catheter are customarily used. Modifications of this simple instrument are almost as numerous as the surgeons who have drained more than 5 cases of empyema. New models appear almost as frequently as those of automobiles, and are obsolescent almost as soon as new airplanes, which are thought by some to be obsolete at the time of the first test flight. The search still goes on for the perfect instrument that will provide adequate drainage without injury to the patient. No one instrument enjoys very widespread acceptance and usually the partisans of the use of the instrument are closely gathered about its designer.

Closed operations differ fundamentally from open operations in that the former do not allow inspection and exploration of the empyema cavity. Identification of bronchial fistulas must be inferential; the recognition of accessory pockets depends upon the postoperative course and roentgenograms for the evacuation of fibrous masses; reliance must be placed upon suction and irrigating solutions and finally assurance of dependency of drainage is impossible at the time of operation but must be hoped for and verified by the patient's response to drainage and by post-operative roentgenograms.

Comparisons of the two methods can best be obtained in reports from centers where all methods have been in use for the same periods of time. Thus Wallace's review of 363 cases of empyema in children from the Royal Edinburgh Hospital is of significance. His report deals with all methods of treatment and he has emphasized the fact that

each type of procedure utilized was adopted by choice and not by the expediency of the child's illness. Sixty children were treated by repeated aspirations, of whom 23 (38.3 per cent) died in 66 closed operations were used and 6 (23 per cent) died; 2 had open operations and of these 39 (14.9 per cent) died. The differences are quite striking and Wallace concludes that the most adequate and most successful treatment of empyema in children is by means of rib resection after the mediastinum has become fixed by adhesions.

White and Collins have reported 31 cases from the City of Washington. In this series, treatment by aspiration alone had a mortality of 26.2 per cent with closed drainage 11.4 per cent of the patients died, and 3.6 per cent of the survivors needed secondary rib resection. The mortality of rib resection was 6.5 per cent. The lowest mortality was 3.8 per cent, in 5 cases treated by double rib resection and sucking (so called Connors operation).

On the other hand Utter has reported 283 cases of empyema in children. Fifty three were treated by aspiration of these, 20 (37.8 per cent) recovered, 9 (7.9 per cent) died, and 24 (45.4 per cent) required secondary operation. Closed intercostal drainage was used in 48 and of these 33 (68.7 per cent) recovered, 8 (16.7 per cent) died, and 7 (14.6 per cent) needed secondary rib resection. One hundred and forty five had primary rib resection and 89 (61.4 per cent) recovered 49 (33.8 per cent) died, and 7 (4.8 per cent) developed chronic empyema.

It is quite possible that the relatively high mortality with rib resection as reported by Utter was due to too early operation, i.e., the creation of an open pneumothorax before the empyema had become localized, and the mediastinum and lung fixed by pleural adhesions.

Mihara has reviewed cases from hospitals in Fukuoka, Japan. Closed intercostal drainage as used in 9 cases with 5 deaths (56.3 per cent) and 8 subsequent rib resections. Open drainage (rib resection) was used in 69 patients with 9 deaths (13 per cent) and 6 who had to have subsequent thoracoplasty for chronic empyema.

Burpee used intercostal closed drainage in 2 children with 3 deaths (43 per cent) and rib resection in 37 children with 6 deaths (16.2 per cent).

Hochberg and Kramer have reported 300 cases of empyema in children under fifteen years of age. Closed intercostal drainage was used in 64 patients and 1 (7.9 per cent) died; open drainage with rib resection was used in 14 children with only 7 deaths (5.6 per cent).

Mason's strong recommendation of rib resection as the method of choice even in children is based on his experiences with closed operations which were performed on 30 children with 0 deaths (0 per cent); rib resection in 72 children gave a mortality of 6.94 per cent. Furthermore 6 of the survivors in the first group had to have subsequent rib resection.

From all this it would seem that even in children drainage by rib resection at the proper time is a safer procedure than any other form of treat-

ment There is, furthermore, no significant difference in the length of postoperative hospitalization. Of course, even more strikingly low mortalities have been reported by authors who have almost exclusively used one method or the other. Mortality rates have varied from 0 in 53 cases to 33.8 per cent in 145 cases. The obvious inference is that a low mortality is considerably dependent upon local conditions. The universal mortality in patients of all ages as gleaned from more than a score of reports in the literature is about 15 per cent.

New operations which, in my opinion, are worthy of special mention are those of Connors and Weinberg. Connors advocates the following operation for the drainage of empyema and the prevention of chronic empyema:

An incision is made along the line of the rib over the central portion of the empyema cavity. Two or three inches of two ribs are resected subperiosteally, and the intercostal muscles, vessels, and nerves are removed *en masse*. A large window is made in the parietal pleura, and the cavity is cleared of pus and fibrin and then packed fairly tightly. The packing is usually removed on the second or third day and subsequent packs are used down only to the parietal pleura. Seventy-four cases have been operated on by this method, 55 adults and 19 children; the mortality was 6.6 per cent. Of the 5 patients who died, 2 had developed severe contralateral pulmonary infection, 1 had had an overwhelming toxemia following miscarriage and pneumonia, and the 2 others died of complications. Carnazzo has used this same method in 20 patients without any deaths.

Weinberg's operation was devised in a search for a simple procedure because it had been his feeling that anyone who reviews the various methods of treatment which have been devised in recent years, particularly the closed methods, must be impressed by the complicated apparatus and details of management entailed in their use. The operation which Weinberg has used in 53 patients with no deaths is the complete excision of the intercostal muscle bundle between two ribs, together with the removal of the muscles which overlie the opening thus made. The pleura is widely opened and the opening closed by a tampon of rubber tissue packed with gauze, which permits the escape of pus but prevents the ingress of air. His results have been excellent.

It must be understood that the operations advocated by Weinberg and by Connors must never be undertaken before pleural adhesions have formed sufficiently to insure against mediastinal displacement when the pleural cavity is opened.

Koster and his associates have been impressed by the striking omission from the literature on empyema of a consideration of the factors responsible for prolonged morbidity. From 1929 to 1934 they treated 118 cases of empyema by open drainage with rib resection. In 5 cases convalescence was greatly prolonged because of complications. In the remaining 113 cases an average of forty-five days elapsed between the institution of drainage and complete healing of the wound.

These authors believe that healing of an empyema cavity is greatly dependent upon the activity of the underlying lung. In order to increase the respiratory movements of the lung on the affected side they have induced a contralateral artificial pneumothorax. They report 21 cases of acute empyema treated by means of closed intercostal catheter drainage with contralateral artificial pneumothorax. Seventeen occurred in children up to the age of twelve and 4 in adults. In the more drainage of pus was fourteen days. In the adults the average duration of drainage was twenty-one and two-tenths days. In 1 case, a child one year of age died about two hours after the administration of the first pneumothorax. Death was attributed to air embolism. In another case, a girl of twelve, a spontaneous pneumothorax developed and apparently the child's life was saved by continuous aspiration of the air through an intercostal catheter. Several of the patients developed subcutaneous emphysema subsequent to the administration of the pneumothorax.

In the reproduced roentgenograms the mediastinal structures and trachea are pushed into the infected side of the chest by the presence of the large pneumothorax on the contralateral side. The authors believe that this is helpful in promoting early closure of the cavity and that, furthermore, the increased respiratory demands on the lung underlying the empyema cavity aid in its reexpansion and the subsequent obliteration of the cavity.

This method of treatment is designed purely to shorten the period of convalescence and is in no way expected to decrease the death rate from empyema. It is not a justifiable procedure because (1) it seems inadvisable to increase so greatly the activity of a lung which has so recently been the site of pneumonia and in which there may still be residual infection; (2) it seems undesirable to plan deliberately for distortion of the mediastinal structures and the trachea; (3) absorption of toxins is greatly increased by dyspnea; (4) spontaneous pneumothorax is an ever present danger in the induction of any pneumothorax and may at times be fatal; and (5) air embolism which caused 1

death in Koster's series of cases, is a serious reason for not lightly undertaking this method of treatment. The greatest objection is that it is a procedure which carries with it, in the authors' series, a mortality rate of 5 per cent and a 10 per cent occurrence of serious complications. Such a high mortality rate for a procedure which is designed only to reduce by a few days the time spent in the hospital, makes this method of treatment absolutely unjustifiable.

With so many types of treatment to choose from, it is manifestly impossible for any one person to have had a wide experience with all of them. I believe that there is no doubt but that surgical drainage will be attended by the lowest mortality, the highest percentage of complete cures, and the fewest recurrences. We have long used with excellent results a plan of treatment that depends on the following factors:

1. A proper period of aspiration to reduce toxic absorption and intrapleural pressure and to allow time for fixation of the mediastinum.

2. When the pus has become walled off a segment of rib at the most dependent point of the cavity should be removed and a large rubber tube inserted in the cavity.

3. This tube, which should be sufficiently large to allow complete drainage of all pus and fibrin masses, should fit snugly in the pleural opening in order to be air-tight.

4. The distal end of the tube should be connected to a suction apparatus that will produce varying degrees of negative pressure as desired.

5. The tube is not to be removed permanently from the chest until the intrapleural cavity is completely closed.

This method of treatment has been found to be entirely satisfactory in all types of non-tuberculous empyema and in infants as well as in children and adults. Very rarely and then only because of the very precarious condition of the patient, drainage by means of an intercostal catheter may be resorted to, but only as a preliminary to an almost inevitable rib resection.

INFECTIONS OF CHEST WALL

It is difficult to determine how often the chest wall becomes infected about a drainage tube. However, it is my belief that infection occurs frequently about those tubes that are tightly sewn in place. Some champions of the closed intercostal drainage method believe. It is most important that the skin incision should be as small as possible so that when the catheter is in position the skin closes around it and helps make the wound air-tight. On the other hand others agree

with Hart who thinks it is very important to make a skin incision large enough to allow free drainage if there is any leakage of pus around the tube.

To be censured is the rather widespread custom of tightly closing the wound about a drainage tube which has been put in place after rib resection. The error of this procedure should be but is not, all too apparent. The distressing spreading infection that may occur therefrom is, fortunately infrequent, but the credit for this infrequency belongs to someone other than the surgeon who sews up a grossly infected wound.

Brandberg has reported a case of progressive gangrene of the skin following operation for pleural empyema. The operation was a rib resection and, although a complete description is lacking, the author describes the first changes in the skin as occurring about the suture channels in the operative wound. Of still greater significance is the fact that in the pleural cavity was one-third of a litre of evil smelling matter in which streptococci could be demonstrated. It is entirely possible that an anaerobic organism played no small part in the extensive gangrene of the skin that started about ten days after the operation. The patient recovered but only after numerous excisions of the skin and subsequent skin grafts.

Brandberg found 4 similar cases in the literature. Stewart Wallace has reported a similar case of slowly progressive gangrene of the skin and subcutaneous tissue secondary to rib resection for drainage of empyema. In his case, too, the skin and underlying tissues were tightly sutured about the drainage tube in order that an air-tight system might be set up. Six days after drainage there was obvious infection of the wound and therefore the skin sutures were removed. The infection spread rapidly soon involving an area of skin and subcutaneous tissue extending from the opposite iliac crest over the entire back and up to the occiput. Despite varied treatment—local antiseptics, diphtheria antitoxin, staphylococcus toxin, and autogenous vaccine—the patient died thirty-two weeks after operation. It was not until after death that the infection was recognized as being due to the symbiotic activity of a micro-aerophilic streptococcus and the staphylococcus. (Meleney has admirably described these infections and offered a sound plan for treatment consisting of complete excision of all infected tissue and the use of zinc peroxide in the wound.)

These cases should be a stern warning against the practice of tightly closing empyema wounds around a drainage tube and thereby favoring the burrowing of infected material from the pleural cavity into the subcutaneous tissues.

air-tight drainage is necessary and advisable, can be obtained without difficulty by achieving a snug fit of the tube in the *pleural* opening, lining the otherwise open wound with vaseline, and, as an added precaution, passing the drainage tube through a rubber sponge which tightly hugs the chest wall. Drainage from him is not thereby impeded but the ingress of air is prevented.

POSTOPERATIVE TREATMENT

Postoperative treatment other than care of the empyema cavity, dressing of the wound, and attention to the drainage apparatus has not received proper share of attention. Particularly in children the care of the patient is of utmost importance. Bisgard has stressed the importance of preventing permanent scoliosis and of interacting the temporary scoliosis that accompanies acute empyema. That scoliosis is an important feature in empyema has been brought out by Erdus and Holman who found that 46 (92 per cent) of 50 patients with acute empyema had roentgenological evidence of scoliosis before treatment was instituted.

Cabitt and Hurwitz believe that reliable estimation of the healing of an empyema cavity can be made only by roentgenological examination after the cavity has been filled with iodized oil. They have found that ordinary films are misleading and that the amount of saline solution that can be used in measuring the capacity of the cavity is usually much less than the actual size of the cavity. However, by the use of roentgenograms after the instillation of iodized oil, accurate determinations of the size of the cavity and the progress of healing may be made. Since too early removal of the tube is a frequent cause of recurrent empyema, Cabitt and Hurwitz think that the drainage tube should be removed only after the injection of lipiodol demonstrates a completely obliterated pleural space.

In measuring the capacity of a cavity by filling with saline solution, or in mapping its outline with lipiodol, care must be taken to have the drainage opening uppermost and to insert the instillation catheter to the most distant point of the cavity. Otherwise the solution may not reach all portions of the cavity.

Schenck and Hochberg believe that physical examination is of small value in following the course of an empyema. They are convinced that this is only by the use of frequent roentgenograms that proper after-care can be given.

Roentgenograms to be of use in postoperative empyema should be taken by the Potter-Bucky

technique or some similar method. Roentgenograms taken with ordinary chest technique are unlikely to provide for sufficient penetration of the thick pleura to present accurate information about the empyema cavity.

The use of blow-bottles or rubber balloons as an aid to early reexpansion of the lung has been variously advocated and decried as worthless or even harmful. Gumpel believes that such respiratory exercise is of value and has described a system of blow-bottles fashioned from a mason jar, a water pitcher, two glass drinking tubes, and several lengths of rubber tubing. The virtues of this apparatus (*ersatz*, as it is) are that it is cheap, easy to make, and light in weight, and its use can be readily supervised by the patient. Thomas also advocates the use of blow-bottles to aid in pulmonary reexpansion.

Roberts has found that blow-bottles and balloons are of little value and advocates instead the controlled, inspiratory exercises developed by McMahon. Roberts has said, "I consider that this is one of the greatest advances in the treatment of empyema of late years, and properly applied it has rendered the incidence of chronic cavities much less." These exercises are designed to act upon that part of the chest most in need, and it is surprising that even small children can learn to accentuate the respiratory excursions of that part of the chest which is most in need of the exercise.

Of far greater value than blow-bottles or respiratory exercises in promoting early reexpansion of the lung is the use of suction of any desirable degree. This may be used satisfactorily after rib resection and has repeatedly proved efficacious in shortening the period of postoperative convalescence and in preventing the development of chronic empyema.

Witman has used the Drinker respirator to promote expansion of the lung in cases in which there has been no noticeable expansion after many weeks. In a case which was so treated the lung, which had been collapsed for fifty-four days, completely reexpanded after four daily treatments of an hour in the respirator at pressures of from 0 to -18 cm. of water; the wound also healed within six days. In another case the result was not so striking but there was considerable improvement of a long-standing empyema.

Green believes that "good medical care with attention to the nutrition of the patient" is one of the fundamental principles of treatment of empyema. Ramirez has stressed the importance of postoperative supportive treatment and the importance of close cooperation between the surgeon

and pediatrician. He believes that in addition to a high-caloric, high vitamin diet, cardiovascular tonics should be used when necessary and drops of eucalyptol and gersonol should be introduced into the nose to disinfect the nasopharyngeal secretions. (The wisdom of this practice in children is decidedly doubtful because of the increasing frequency of development of lipid pneumonia.)

Schneegans and others believe that frequent transfusions of whole blood are of great value in treating children who have empyema.

CHRONIC EMPYEMA

Brock has offered the most satisfactory answer to the troublesome question as to when acute empyema becomes chronic: he believes that empyema may properly be called chronic when the process of obliteration of the cavity has stopped or has become so slow as to be negligible.

The possible causes of chronic empyema—although not the relative importance of these causes—are generally agreed upon. Roberts has offered the following very satisfactory classification of the condition: (1) latent empyema, in which the empyema with or without bronchial fistula is not discovered for many months or even years; (2) persistent empyema, in which the empyema persists for an abnormal length of time after drainage; and (3) tuberculous empyema. Persistent empyema is due to: (1) too early removal of the drainage tube; (2) persistence of the infection in the cavity because the fibrin was not removed at the time of drainage, or the tube used did not have a lumen sufficiently large to allow adequate drainage; (3) non-dependent drainage; (4) a drainage tube which is too long or too short; (5) delayed expansion of the lung caused by thickening of the pleura, bronchopleural fistula, or fibrosis of the lung; (6) a foreign body in the cavity, usually a tube or other drainage material; and (7) unsuspected tuberculous, actinomycosis, or neoplasm.

Brock and Bettman agree that by far the most common cause is premature removal of the drainage tube. Figarella believes that a non-dependent drainage site is one of the most important causes of chronicity. Hart has stated that 5 per cent of the chronic empyemas seen by him had a foreign body as the basis of their chronicity.

Whatever the cause, the consensus is that prevention is the best treatment. Certainly the only causes of chronic empyema for which the physician is not to blame are tuberculous actinomycosis, or a neoplasm, and occasionally a very large bronchopleural fistula. In any case prompt, proper adequately supervised, and sufficiently

prolonged treatment of acute empyema should offer reasonable insurance against chronicity of the infection. In Bohrer's series of 265 cases in children none developed chronic empyema. Utter has reported 282 cases of empyema in children and of these 6 required subsequent thoracoplasty for the cure of chronic empyema. The actual incidence cannot be accurately determined without better follow-up systems than are in use in most places. It is probably true that the majority of patients who develop chronic empyema during or after the care of one physician, go elsewhere for subsequent treatment.

Inasmuch as proper care will in most cases prevent the development of chronic empyema, the means of prevention should be considered. The ill effects of too early removal of the drainage tube can be circumvented only by leaving the tube in place until the entire pleural cavity has been obliterated and no cavity remains except the superficial wound; the latter should then be allowed to close—but firmly and from the depths outward. The proper time for removal of the tube can best be determined by taking roentgenograms after the instillation of iodized oil into the cavity.

The presence of large amounts of fibrin in the pleural cavity may cause a persistent infection; therefore the removal of all fibrin is desirable. There is no doubt but that this can best be done by open thoracotomy and least well done by aspiration through needle. Irrigating solutions are of doubtful efficacy in dissolving fibrin.

Despite a few thors who disagree effective drainage should be at a dependent point. In planning the proper site it should be remembered that the patient will spend most of his hours in a more or less erect position so the drainage tube should be as near to the mid-scapular line and as low as possible. The proper site for the drainage tube should be determined by careful study of roentgenograms and by aspiration of pus at the operating table. It is astonishing how many patients with chronic empyema recover after the resection of a rib at level lower than that of the original drainage site which was not strictly dependent. As a corollary to this urgent need for dependent drainage, the drainage tube should be of the proper length. If it is too long and fits snugly into the pleural opening, no pus will drain through it until the level of the fluid is as high as the opening in the tube. If too short, the tube will not maintain the patency of the pleural opening. The inner opening of the drainage tube should be just within the parietal pleura and this proper length should be determined accurately by digital examination or by measuring with a sound. Of course, by put

ting numerous windows in the sides of the tube, one at least will be dependent and then a longer length of tube can be placed within the cavity. However, fenestrations in a drainage tube will very quickly become filled with granulation tissue which will obstruct drainage through these openings and may even entirely fill the lumen of the tube. A long length of tubing within the chest adds the hazard of irritation and possible necrosis of the lung.

The rigid thickening of the visceral pleura that may prevent expansion of the lung can be prevented by prompt and complete drainage so that the underlying lung will not too long remain collapsed. The use of suction postoperatively will be of great value in overcoming the resistance to expansion of a lung covered by thick pleura.

Prevention of the development of a bronchopleural fistula may not be possible but perpetuation of it may be avoided by prompt drainage of the empyema. Simple drainage and the provision of an adequate outlet for the pus is usually all that is necessary to bring about the closure of a bronchopleural fistula that developed only because there was no other way out for the pus. Very large bronchial fistulas may persist after simple drainage and closure of them may be accomplished only by plastic operations.

Fibrosis of the lung as a cause of chronic empyema has been noted especially by Butler, who believes that the pulmonary fibrosis observed in chronic empyema may have slowly formed within an unexpanded atelectatic lobe and that this atelectasis is in some instances caused by bronchial obstruction. The obstruction is caused by the external pressure exerted by a pleural exudate upon a lobe or lobes still filled with pneumonic secretions. If the pressure is not relieved by drainage, the lobes do not immediately reexpand but remain practically functionless and there is a consequent accumulation of secretions in the smaller bronchi, bronchioles, and alveoli. Since respiratory efforts are not in themselves sufficient to evacuate these secretions, aspirations through a bronchoscope should be carried out. About 2 per cent of all postpneumonic empyemas will be complicated by an atelectasis of one or more lobes of the lung on the affected side. This predisposes to chronicity of the empyema and unless relieved will lead to pulmonary fibrosis and the type of chronic empyema that can be cured only by a mutilating type of thoracoplasty. Such atelectasis should be suspected whenever a postpneumonic empyema fails to clear up within about a month and no other satisfactory explanation can be found. Bronchoscopic examination after the

exclusion of other causes will provide the diagnosis. Endobronchial aspiration is the only feasible treatment. Butler has had 4 such cases among 189 cases of acute empyema.

The presence of a foreign body as a cause of chronic empyema is almost always due to carelessness on the part of the attending surgeon. Insecurely anchored drainage tubes or gauze packs, inattention to the importance of removing all that has been put into a wound, and carelessness in doing dressings are obviously reprehensible technical errors. Bone chips should not be allowed to fall into the cavity at the time of rib resection, and proper resection of a rib will almost always prevent the subsequent development of osteomyelitis in the rib. Overholt has proposed turning flaps of periosteum over the cut ends of the ribs, and Churchill has shown that osteomyelitis will seldom occur if the periosteum is cut squarely and exactly at the resected ends of the rib. In other words, bone should not be denuded of its periosteum beyond the limits of resection.

The presence of unsuspected tuberculosis or actinomycosis can be ascertained by careful bacteriological examination of the pus or by histological examination of a small piece of parietal pleura. Alexander believes that a piece of parietal pleura should always be removed for bioptic examination at the time of rib resection for drainage of empyema.

The first step in the treatment of chronic empyema should, in most cases, be redrainage at the most dependent point. The attempt should then be made to reexpand the lung by suction and by breathing exercises. Not infrequently the use of negative pressure obtained either by means of a vacuum pump or a siphonage system will be sufficient. Lloyd has reported 17 cases of chronic empyema which were cured by continuous suction of from 12 to 16 in. of water. Even more highly negative pressures may be used with safety and effectively. Bernou, Canonne, and Marécaux have used negative pressures as low as minus 200 cm. of water and even as low as minus 50 cm. of mercury (minus 680 cm. of water). It is necessary to reduce the pressures to such low points gradually in order to avoid bleeding and possible torsion of the great vessels by mediastinal displacement. Usually such extreme pressures are not necessary.

McLellan and Tixer and others have reported cures of chronic empyema with suction methods.

If such measures fail to bring the lung in contact with the chest wall and thereby obliterate the cavity, then surgical measures are necessary either to fill the cavity with a graft of some kind or to collapse the chest wall onto the lung.

In the past, several operations have been proposed to make the stiff walls of a chronic empyema cavity softer and more yielding. Eastlander and Schede have devised operations on the parietal walls to bring about closure, and Deformé has approached from the other side by decortication of the thick and unyielding visceral pleural scar.

The Ransohoff operation (multiple gridiron incisions through the visceral pleura has also been used to facilitate the expansion of the lung. More recently partial extrapleural thoracoplasty with subsequent unroofing of the small remaining cavity by the Schede method has been used by many surgeons. At each stage of the extrapleural thoracoplasty the periosteum should be treated thoroughly with 10 per cent formalin to prevent too early regeneration of the ribs. By this method of extrapleural removal of the ribs a large cavity may be reduced to a very small one, which may then be easily unroofed without the operative risk and mutilation that is attendant upon an extensive Schede rib resection. Martin believes that the modern method of treatment should combine the method of Schede, namely the removal of ribs, periosteum, intercostal muscles, and parietal pleura, and the removal of the visceral pleura (Deformé). He does not find necessary the entire removal of the rigid parietal and visceral pleura but simply enough of it to start healing which will continue provided reinfection is avoided. By this method Martin has cured 20 of 26 patients with chronic empyema; the remaining 6 still had persistent fistulas and residual cavities.

Roberts has expressed his disappointment with the decortication operation of Fowler and Deformé and has no approval for the Ransohoff procedure. Furthermore, he believes that the Eastlander and Schede operations carry an almost prohibitively high mortality of about 50 per cent.

The operation which Roberts uses follows a preliminary period of proper drainage. The ribs overlying the cavity are resected subperiosteally in as many stages as necessary; at each operation the drainage opening is sealed for a few days to prevent infection of the operative wound. Then the cavity is laid open along its anterior margin and the incision is continued around the apex of the cavity in such a way that the thickened parietal pleura with the overlying intercostal muscle bundles and periosteum form a pedunculated flap which is hinged posteriorly. Thus the blood supply of the flap is preserved. Where the visceral layer of thickened pleura joins the parietal layer posteriorly a wedge of fibrous tissue is removed so that the outer wall of the cavity can fall in contact with the inner wall. Gauze impregnated with

flavin and paraffin is now placed on the outer surface of the flap and the skin and superficial muscles are sutured over it. A week later the wound is opened and the internal gauze removed. It is usually found that the cavity is obliterated by adhesion of its walls. The wound is then resutured over drains and an external pressure dressing is applied. Roberts has used this method successfully in 100 cases with only 1 death.

Wangensteen has proposed a method for the extrapleural removal of the ribs by means of extensive subcutaneous tunnelling through short anterior and posterior incisions. It is his contention that this obviates the need for an otherwise large and often shocking incision. The dangers of such blind removal of ribs are great.

Jachia thinks that in chronic empyema the Schede operation is frequently too much for an already debilitated patient to withstand and that, in addition, operating on the already infected pleura is frequently the cause of extensive sequestration. He prefers a combined Eastlander and Schede procedure. In order to prevent rib regeneration, the periosteum which remains is painted with Zenker's solution.

Carter believes that there are three types of chronic empyema in which complete obliteration of the cavity does not occur even under ideal conditions of drainage: (1) secondarily infected tuberculous empyema; (2) non-tuberculous empyema that has lasted several years; and (3) chronic empyema complicated by a bronchial fistula. Since the first and most important requisite in the treatment of chronic empyema is to create ideal conditions of drainage, Carter believes that the chest wall should be widely opened by the resection of from 4 to 6 in. of two or three ribs at the lower most portion of the cavity. The underlying thickened parietal pleura is excised. A large muscle flap of the latissimus dorsi and the trapezius muscle is mobilized widely around the sinus and preserved for future use in closing the cavity. After the wound has become clean, muscle flaps of the latissimus dorsi and trapezius for the lower portions of the cavity, the sacrospinalis group for the apical portion, and the intercostal muscles as available, are used to fill the cavity completely. The pectoral muscles can be utilized for an empyema cavity in the anterolateral thorax.

Gerlock has reported the cure of chronic empyema of eight years' duration by means of a staged thoracoplasty and the closure of several bronchial fistulas by the insertion of muscle flaps into the fistulous openings. These flaps may be fashioned from the intercostal muscles or from the sacrospinalis if this is more accessible.

Gray has reported the use of the pectoralis major and the latissimus dorsi in the obliteration of large empyema cavities and Rice has made similar use of the pectoral and dorsal muscles.

Ichim has used maggots in the infected wound that resulted after a partial Scheuch thoracoplasty for chronic empyema. After about twelve days of treatment with maggots the wound was clean and healing was almost complete within six weeks.

Meade has reported 14 cases of recurrent empyema among 50 cases of acute and chronic empyema. In these the recurrence had taken place after freedom from a severe and extensive empyema for from one week to thirty weeks. Presumably inadequate treatment at the time of the original operation was responsible. A residual cavity with thick walls is a characteristic may be latent is the usual cause of such recurrences.

SCOLIOSIS

The diagnostic importance of scoliosis following empyema has been emphasized by Arthur and Holm in they found in 60 per cent of 20 patients with acute empyema, but in only 10 per cent of patients with chronic and in 8 per cent of those with simple pleural effusions. It is their belief that the degree of scoliosis varies directly with the duration of the empyema and inversely with the age of the patient. Inasmuch as the scoliosis can be expected to disappear after drainage of the empyema, if it persists one should suspect an undrained pocket of pus.

In acute empyema the accompanying scoliosis may be convex toward the affected side if the hemithorax is very full of pus. However the curve of the spine will be concave toward the empyema side when the hemithorax is not very full of pus and when the intercostal muscles are in spasm.

Begard has reported 11 cases of severe curvature of the spine which developed in patients with chronic pleuritis, 7 of these patients had empyema. He states that thoracogenic spinal curvatures are pleurogenic or result from thoracoplasty. As a rule, with the onset of empyema a slight lateral deviation of the spine develops with the concavity on the affected side. This results from spasm of the muscles on that side. With early cure the muscles relax and the curvature corrects itself spontaneously. If the disease becomes chronic or is productive of much pleural scar tissue, a spinal deviation occurs with the convexity of the curve projecting into the healthy side, which is the reverse of that caused by thoracoplasty. In this type of pleurogenic scoliosis there is little or no rotation of the vertebral bodies.

Hence there is no posterior bulge of the thoracic wall. The mediastinum which is fixed to the spine by scar tissue usually deviates with the spine and this together with the reduction in the size of the hemithorax and the relative fixation of the lung, leads to reduction of the vital capacity proportional to the deformity. In 107 cases of acute empyema and an equal number of chronic empyema it is found that the younger the individual is the more likely and more extensive the curvature and similarly, the more chronic the empyema the more likely and more extensive the curvature. In scoliosis due to thoracoplasty the scoliosis is rotary and otherwise considerably different from the pleurogenic type. The Scheuch type of thoracoplasty produced greater imbalance and greater scoliosis than did the extrapleural type. The first objective in the prevention of pleural coliosis is early and adequate treatment of the empyema. In the postoperative treatment the patient should lie on his side in such a way as to deviate the spine in the direction of overcorrection; this can be accomplished by the use of a soft wedge such as a rolled pillow placed under the patient's shoulder or wall. In cases of developed or potential pleural coliosis the wedge is placed behind the axilla of the diseased side. For infants a plaster bed which maintains the spine in this position of overcorrection can be made. If the curvature persists after the patient has become ambulatory a corrective plaster jacket should be used.

Chandler believes that scoliosis very rarely persists after drainage of the empyema, he found only 1 case of persistent scoliosis among 280 cases of empyema the scoliosis in 270 having disappeared after drainage and exercise.

PUTRID EMPYEMA

Neuhof and Hirschfeld have called attention to putrid empyema as a distinct pathological entity. In most cases it is caused by the rupture of a pulmonary abscess into the pleural space. Other causes are putrefaction after intrapleural hemorrhage, necrosis of the lung following infarction or trauma, and pleural invasion from an anaerobic subphrenic abscess. The infection that ensues is due to anaerobic bacilli. Tissue necrosis is a predominant feature, therefore the adhesions, which form early in the infection, may disappear by liquefaction if the anaerobic infection persists. The lining of the cavity is inflamed, hemorrhagic, and sometimes gangrenous.

Neuhof and Hirschfeld have reported 51 cases, of these 25 were due to ruptured acute pulmonary abscess, 16 to ruptured chronic abscess, and 10

followed operations for abscess. They have discussed the diagnosis and treatment of putrid empyema and have emphasized the importance of considering it apart from other types of empyema. They believe that in the acute cases recognition of putrid empyema may be difficult until foul pus is disclosed by aspiration. The onset and course closely resemble pneumonia but the pain is localized and constant. The sputum is scanty or absent and is not blood streaked. If foul sputum or a foul odor is present, the diagnosis is established. The course may be extremely fulminating. Roentgenograms are of importance particularly in localizing the fluid. The aspiration of foul pus or foul air is pathognomonic and following its disclosure, operation should be immediately performed, since nothing is to be gained by delay and since after the aspiration of foul pus there is great possibility of the development of putrid phlegmon of the chest wall. This occurred four times and in each of these 4 cases operation had been deferred after positive aspiration.

Neuhof and Hirschfeld believe that the essential principles of treatment are complete evacuation of the pus, adequate aeration, and adequate cure of residual lesions in the lung or pleura. To accomplish these objects wide unrooing which will allow full visualization of the cavity is imperative. Costal resection should be just short of the limits of the lesion in order to avoid entry into the uninvolved portion of the pleural space. The lesion in the lung should be visualized in order that drainage will be maintained to the site of the bronchial fistula and in order that better drainage of the pulmonary abscess may be obtained if necessary. The cavity and all its recesses are then packed with iodoform gauze. (It is probable that zinc peroxide as advocated by McLeney would be of greater value in these anaerobic infections.) Post-operatively the patient's improvement is dramatic if adequate operation has been performed.

Longacre and Herrmann in producing experimental pulmonary abscesses in dogs found that the incidence of empyema depended upon the overwhelming nature of the infection and the ability of the lung to set up defensive barriers before the necrotic process reached the surface.

Kline and Berger have reported on 55 patients with pulmonary spirochetosis (Miller Vincent infection of the lung). Of these 36 had empyema and 9 of this group died. The authors agree with others who have seriously considered the problem that thoracotomy, if productive of foul pus or foul air should be followed promptly by rib resection and wide-open drainage. Otherwise the danger of gangrene of the chest wall is great.

Flack has reported 4 cases of empyema accompanying severe pulmonary fusospirochetal infection. Of the 3 patients who had closed intercostal drainage, 2 died. It is unwise to use this type of drainage in putrid empyema since the infection is due to anaerobic or micro-aerophilic organisms consequently every effort should be made to introduce oxygen into the infected area. Neuhof has pointed out that there is no danger from early open drainage because of the rapid formation of stabilizing adhesions.

Fisher and Abernethy have had similar experience in treating 4 cases of putrid empyema with closed drainage only 1 patient recovered. 1 of their cases anaerobic streptococci were found in the pleural fluid.

Dooley and Jones recognize the importance of obtaining prompt and complete evacuation of the pus through a large opening. The operative procedure they have successfully used has been the resection of a long posterolateral segment of the ninth or tenth rib extending 8 cm anteriorly from the transverse process of the corresponding vertebra. As the diaphragm rises the thoracotomy opening being diagonal, still maintains completely dependent drainage. Immediately following the opening of the parietal pleura throughout the full length of the resected rib a very large thick dressing is applied and the patient promptly placed on his back. The weight of the body and the saturation of the dressings prevent ingress of air although drainage is free. After three or four days Penrose drains are placed in the cavity.

The death rate from putrid empyema need not be high if recognition is prompt, diagnosis accurate and treatment immediate and adequate. If foul pus is aspirated from an empyema cavity immediate open drainage should be instituted. Rib resection is the method of treatment that has given satisfactory result. All other less radical methods have unreasonably high mortality rates.

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followed operations for abscess. They have discussed the diagnosis and treatment of putrid empyema and have emphasized the importance of considering it apart from the other types of empyema. They believe that in the acute cases recognition of putrid empyema may be difficult until foul pus is disclosed by aspiration. The onset and course closely resemble pneumonia but the pain is localized and constant. The sputum is scanty or absent and is not blood-streaked. If foul sputum or a foul odor is present, the diagnosis is established. The course may be extremely fulminating. Roentgenograms are of importance particularly in localizing the fluid. The aspiration of foul pus or foul air is pathognomonic and following its disclosure operation should be immediately performed, since nothing is to be gained by delay and since after the aspiration of foul pus there is great possibility of the development of putrid phlegmon of the chest wall. This occurred four times and in each of these 4 cases operation had been deferred after positive aspiration.

Neuhof and Hirschfeld believe that the essential principles of treatment are complete evacuation of the pus, adequate aeration and adequate care of residual lesions in the lung or pleura. To accomplish these objects wide unroofing which will allow full visualization of the cavity is imperative. Costal resection should be just short of the limits of the lesion in order to avoid entry into the uninvolved portion of the pleural space. The lesion in the lung should be visualized in order that drainage will be maintained to the site of the bronchial fistula and in order that better drainage of the pulmonary abscess may be obtained if necessary. The cavity and all its recesses are then packed with iodoform gauze. (It is probable that zinc peroxide as advocated by McEwen would be of greater value in these anaerobic infections.) Post-operatively the patient's improvement is dramatic if adequate operation has been performed.

Longacre and Herrmann in producing experimental pulmonary abscesses in dogs found that the incidence of empyema depended upon the overwhelming nature of the infection and the ability of the lung to set up defensive barriers before the necrotic process reached the surface.

Kline and Berger have reported on 55 patients with pulmonary spirochetosis (Miller Vincent's infection of the lung). Of these, 26 had empyema and 9 of this group died. The authors agree with others who have seriously considered the problem that thoracotomy, if productive of foul pus or foul air should be followed promptly by rib resection and wide-open drainage. Otherwise the danger of gangrene of the chest wall is great.

Flack has reported 4 cases of empyema accompanying severe pulmonary fusospirochetal infection. Of the 3 patients who had closed intercostal drainage, 2 died. It is unwise to use this type of drainage in putrid empyema since the infection is due to anaerobic or micro-aerophilic organisms consequently every effort should be made to introduce oxygen into the infected area. Neuhof has pointed out that there is no danger from early open drainage because of the rapid formation of stabilizing adhesions.

Fisher and Abemethy have had similar experience in treating 4 cases of putrid empyema with closed drainage only 1 patient recovered. In 3 of their cases anaerobic streptococci were found in the pleural fluid.

Doley and Jones recognize the importance of obtaining prompt and complete evacuation of the pus through a large opening. The operative procedure they have successfully used has been the resection of a long posterolateral segment of the ninth or tenth ribs extending anteriorly from the transverse process of the corresponding vertebra. As the diaphragm rises the thoracotomy opening, being diagonal still maintains completely dependent drainage. Immediately following the opening of the parietal pleura throughout the full length of the resected rib a very large thick dressing is applied and the patient promptly placed on his back. The weight of the body and the saturation of the dressings prevent ingress of air although drainage is free. After three or four days Penrose drains are placed in the cavity.

The death rate from putrid empyema need not be high if recognition is prompt, diagnosis accurate and treatment immediate and adequate. If foul pus is aspirated from an empyema cavity immediate open drainage should be instituted. Rib resection is the method of treatment that has given satisfactory results, all other less radical methods have unreasonably high mortality rates.

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SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Zuckerman, S An Experimental Study of Blast Injuries to the Lungs *Lancet*, 1940, 239 219

By blast is meant the compression and suction wave which is set up by the detonation of high explosives

Mice, rats, guinea pigs, cats, monkeys, and pigeons were exposed, in the open, to blast from the explosion of charges of 70 lb of high explosive, and from the explosion of hydrogen and oxygen in balloons

In the high explosive experiments, no animal was ever killed at distances further than 18 feet, and none was ever hurt in any observed way at distances further than 50 feet from the explosion. Almost all the animals between 13 feet (the nearest any animal was placed) and 18 feet were killed, at these distances the positive component of the blast wave (hydrostatic pressure) varied between 126 and 62 lb per sq in. In no animal was there any external sign of injury, the outstanding lesion was bilateral traumatic hemorrhage in the lungs, varying in degree according to the distance of the animals from the charge, and the pressure to which the animals were subjected. In all cases in which the degree of injury was sufficient to kill the animal, blood was present in the upper respiratory passage, it was also present in a few cases in which the animals recovered. The lesions were detectable roentgenographically.

The pulmonary lesions caused by blast from balloon explosions were the same in character, and bilateral, except when the animals were placed so close to the balloon that the exposed side shielded the other. In the latter case, the lesions were mainly or entirely unilateral, and confined to the exposed side.

Animals whose bodies were clothed in thick layers of rubber suffered little or no damage compared to the controls.

It is concluded, from these experiments, that it is the pressure component of blast which bruises the lungs, by its impact on the body wall.

SAMUEL KAHN, M D

Dean, D M, Thomas, A R, and Allison, R S Effects of High-Explosive Blast on the Lungs *Lancet*, 1940, 239 224

A series of 27 patients, who were under treatment for burns or other injuries resulting from the bursting of high explosive bombs at close quarters, is reviewed, with special regard to the state of the chests of these patients. In only 2 cases was the exposure doubtful, in the remainder, severe blast had been experienced.

Only 6 patients complained of symptoms related to the chest, 16 showed some abnormal physical signs, and 14 showed abnormal roentgenograms.

Evidence of serious or gross pathological changes in the chest was absent in all but 2 cases, one of these had signs of collapse of a lobe of a lung, the other had signs of a patchy consolidation of the bronchopneumonic type.

It is impossible to assess the relative importance of the three factors to which the patients were exposed—blast, burns, and immersion—in relation to the chest condition. It was difficult to find cases in which there were no external injuries. Immersion may have played an important part in 1 case, but only 3 patients suffered this experience, and 2 showed neither signs nor symptoms of chest involvement. Burns were extensive, though superficial, but in 1 case, with burns which involved almost the whole skin of the chest, there was no x-ray evidence of chest involvement. Physical examination was not possible in this case.

There is a relative disproportion between the chest symptoms complained of and the physical signs found in the cases studied. This may be due to the fact that all of the patients had suffered serious injuries, which would tend to direct their attention away from the chest. Chest complications may arise after explosion blast without definite warning symptoms, routine examinations should, therefore, be performed even in those who are apparently unaffected by the blast.

The common physical signs are diminished movement of the diaphragm, fullness of the chest, giving it an emphysematous appearance, and impairment of resonance at one or both bases, with or without crepitations. A "blown-up" or ballooned appearance of the chest, especially at the lower costal margins, is frequent. It may be that some true traumatic emphysema results in these cases.

X-rays reveal a diminution of rib expansion, together with a slight loss of translucency, particularly on the left side. This appearance is produced by a slightly thickened pleura, and "bruised pleura" may be the pathological condition present. The reason for the frequent appearance of this condition on the left side is unexplained.

SAMUEL KAHN M D

Ballou, H C, Guernon, A, and Simon, M A Sulfanilamide and Experimental Tuberculosis in the Guinea Pig *J Thoracic Surg*, 1940, 9 584

The authors have reviewed the literature and present a number of experiments to determine the dosage and effect of sulfanilamide upon the course of experimentally induced tuberculosis in the guinea pig. They are of the opinion that sulfanilamide given in proper dosage definitely inhibits the development of artificially induced tuberculosis, but it does not prevent the development of nor cure the tuberculous lesions after they have developed.

JULIAN A MOORE, M D

Samson, P. C.: Indications for Lobectomy and Pneumonectomy in Pulmonary Tuberculosis. *A. M. Surg.* 1940, 30.

Pulmonary resection as treatment for certain types of pulmonary tuberculosis is a procedure not in general use and only 3 cases so treated have been reported in the literature up until August, 1939. The author does 6 cases of planned lobectomy and pneumonectomy 3 of each, with complete discussion and illustration. It suggests certain criteria and indications for these operations.

It is emphasized that resection is not a substitute for thoracoplasty but it may be indicated as the only hope of cure for patients in whom thoracoplasty either has been tried unsuccessfully or seems definitely to offer no benefit. Conditions such as advanced bronchial tenosis which does not respond to attempts at dilatation with atelectasis of the lung and fibrosis, as well as with retention of secretions and toxemia, are sufficient to indicate pneumonectomy. In these cases the lung is already completely collapsed, postural and other forms of drainage are ineffectual or impossible because of the tenosis of the bronchi, and there is no other way of removing the infected and calcified lung tissue. Lobectomy is indicated in cases in which the process is confined to one lobe and in which atelectasis and toxemia or large thick walled cavity cannot be treated adequately by collapse therapy. The position of the lesion too helps to determine the procedure of choice. Lesions in the lower lobes are difficult to drain and sometimes adequate treatment by thoracoplasty is impossible. Another indication for resection, advocated by some authors, is the occurrence of repeated severe hemorrhage from tuberculous cavity. Progressive tracheobronchial ulceration is a contraindication to resection which should be deferred until mucosal healing and fibrostenosis occur.

Operative technique and the hazards of operation are discussed. Of the present series of 6 cases, 4 have either ended in recovery or showed every evidence of a cure. Two terminated fatally following the operation, directly because of transfusion reaction. In one case thoracoplasty had been performed unsuccessfully and in 5 the resection was preferred as a primary procedure. J. E. THORNTON, M.D.

Craford, C., and Linton, P.: The Pedicled Muscle Flap in the Treatment of Bronchial Fistulas. *J. Thoracic Surg.* 1940, 9, 606.

The thoracic credit Abrahamoff, Russian, as being the first to report having closed a bronchial fistula with a pedicled muscle flap. They report having used this method of closing bronchial fistulas on 3 patients with great success.

As a rule the opening of the fistula or residual cavity is enlarged and a pedicled flap of either the pectoral muscles or the latissimus muscle is fashioned large enough and wide enough to fill the cavity completely so as not to leave any space for secretions to stagnate. It is essential that the blood and nerve supply of the flap be left intact.

Occasionally emphysema results and occasionally infection intervenes and defeats the operation. The authors advise an attempt at closure after drainage of pulmonary abscesses as soon as the cavity becomes clean and healthy looking. They advise against waiting months for the cavity to contract and close by natural forces.

In their experience with 3 cases, the plastic operation with pedicled muscle flap has shown itself to be an excellent method of closing residual cavities with bronchial fistulas. J. E. A. MOORE, M.D.

Campbell, J. A.: Effects of Precipitated Silica and of Iron Oxide on the Incidence of Primary Lung Tumors in Mice. *Brit. M. J.* 1940, 2, 175.

Statistical evidence seems to indicate that there is a relatively higher incidence of carcinoma of the lung in metal grinders, engineers, and foundry workers.

The author conducted experiments with mice to determine the effect of inhalation of various dusts on the incidence of lung tumors in mice.

His points out that negative results obtained by other workers were due to the use of a strain of mice not very susceptible to tumors and to not allowing the mice to live long enough to develop tumors. Mice, like men, develop cancer in the last quarter of their lives.

Carefully conducted and controlled experiments exposing mice to definite amounts of dust at regular intervals over varying periods of time show that precipitated silica or brown oxide of iron triples the incidence of primary lung tumors in mice living ten months or longer. The amount of silica used did not cause formation of fibrotic nodules in the lung tissue of the mice and it is suggested that the fully developed fibrotic nodule of silicosis is a bit magnificence. J. E. A. MOORE, M.D.

Hochberg, L. A.: Causes of Failure of Lung Expansion Following Thoracotomy for Acute Postpneumonic Empyema. *Am. J. Roentgenol.* 1940, 44, 73.

The failure of the lung to expand following surgical drainage of postpneumonic empyema may be due to bronchial obstruction caused by thick mucus in the smaller bronchioles and alveoli. Roentgenographic studies are necessary in the diagnosis. HAROLD C. OCKENFELS, M.D.

HEART AND PERICARDIUM

Misa, P. and Martiarena, L. H.: Wounds of the Heart and Pericardium (Heridas del corazon y del pericardio). *Boletín de la Asoc. Quir. Univ. de Buenos Aires*, 1940, 6, 27.

The authors study is based on the observation made in 73 cases of wound of the heart and 7 cases of wound of the pericardium treated at the Municipal Hospital of Santiago de Chile from 1909 to 1939. Seventy-two of the wounds of the heart are caused by knife thrusts and 6 by firearms. The right ventricle is injured most frequently in 33 cases, and the

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left ventricle in 29 cases. When a wound of the heart or of the pericardium is suspected, the localization of the cutaneous wound is of the greatest importance, except in 3 cases, it corresponded to the dangerous zone of Zeidler, that is, the site between the right border of the sternum, the left axillary line, and the second and eighth ribs. The diagnosis is certain when the so called syndrome of wound of the heart is present: the subject is pale, anxious, cyanosed, chilly, and soaked with perspiration, at times he is unconscious and in a state of dyspneic tachycardiac shock, his pulse is very weak and his arterial pressure cannot be verified, or it is so low that the maximum and minimum are close together. This syndrome is also present in wounds of the pericardium when they are followed by hemorrhage. This shows that the syndrome is due to the accumulation of blood in the pericardium and not to the functional changes caused by the wound of the heart. The syndrome is so characteristic that it requires a differential diagnosis if one of its elements is absent or presents itself under a different form, this may occur in penetrating wounds of the chest, whether simple or complicated with wound of the lung, and in wounds of the internal mammary artery.

The only useful treatment is surgical and the technique to be followed will depend on whether there is certainty or only a suspicion of wound of the heart. In the first case, the thoracotomy of Fontan is used and in the second, that of Kocher or Spangaro. The postoperative treatment must include keeping the patient isolated and at absolute rest, eliminating pain, avoiding cardiac tonics and excitomotor drugs, but administering peripheral analeptics, such as adrenaline, camphorated oil, cardiazol, or coramine, avoiding the parenteral administration of fluids without first verifying the arterial pressure, and, finally, administering prontosil or another similar preparation in maximal therapeutic doses as a means of preventing infection, which occurs frequently in these cases.

Complications have arisen in 98.91 per cent of the patients who have been operated upon, in 73.11 per cent there was a hemothorax due to the wound or to

the intervention. Its cause is to be found in the neglect of ligation of the intercostal or the internal mammary artery, strict observance of this surgical rule has lately eliminated hemothorax. Infection is another complication, it occurs either in the operative wound (principally because the traumatic wound has been insufficiently treated and has been included in the surgical wound), or in the pleura or the pericardium (25.20 per cent of the operated cases), and it has appeared in patients who died between forty-eight hours and thirty-seven days after the operation. Surgical cleansing of the pleural and pericardial cavities is indicated to avoid it.

Death must be attributed to the complications hemorrhage and infection. Fourteen of the wounded or 17.94 per cent, have survived, most of them had a wound of the left ventricle. The most exact method for their study is electrocardiography. In accordance with its results, complemented by those of clinical and roentgen examinations, the survivors can be classified in four groups: (1) those who suffered an infarct of the myocardium and improved gradually, (2) those who had the same lesion which persisted electrocardiographically, but who live and are in good condition, (3) 1 patient in whom no cardiac disturbance occurred, and (4) those who had a wound of the auricle, the electrocardiographic characterization of which is not typical and does not quite confirm the operative diagnosis.

Although the symptoms of wound of the pericardium are similar to those of wound of the heart and are also dependent on acute hemopericardium, there were 2 cases in which the symptoms were alarming, although they presented hardly any hemorrhage, such facts are hard to interpret. The intervention and the complications are the same as in wounds of the heart. Fifteen of the patients were operated upon and 2 were not of the former, 11 died, while the latter 2 survived. This gives a survival of 26.66 per cent among the operated patients. In general, the wounds were very grave, in half of the cases, the wound was of the deep thoraco-abdominal type with lesions of the liver, stomach, and spleen.

RICHARD KFMEL, M D

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Shelley H. J.: Incomplete Indirect Inguinal Hernias; A Study of 2,462 Hernias and 2,337 Hernia Repairs. *Arch. Surg.* 940, 41 747

A study was made of all hernias in patients admitted to the wards of St. Luke's Hospital, New York, during the period from 1926 to 1935, inclusive. Also included in the study were all hernias repaired during the period from 1906 to 1935, inclusive, which were observed postoperatively for nine months or longer. This gave a total of 4,443 hernias, of which 2,462 or 55.4 per cent, were incomplete indirect inguinal hernias. They made up 67.4 per cent of all inguinal hernias included in the study.

Of these 2,462 hernias, 1,337 were repaired. Among the 1,668 cases which were followed up for nine months or longer (the average follow-up time was thirty-six months) 190 recurrences were found, an incidence of 7.8 per cent. The average time after operation at which these recurrences were first noted was thirty-four and two-tenths months.

From this study it is apparent that, to add in keeping the recurrence rate low after operative repair of incomplete indirect inguinal hernias, the operations should be performed soon after the appearance of the hernia. This is borne out by the figures which show an absence of recurrences in the first fifteen years of life and very small recurrences for the next ten years of life, with an increasing rate for the greater ages. Also when the hernia was permitted to remain sufficiently long for it to become scrotal, the incidence of recurrences increased by 5 per cent, and the mortality rate became five times greater than that when the hernias are smaller.

The question as to whether bilateral hernias should be repaired at one operation or two cannot be answered conclusively. Since the recurrence rate for operations done in two stages was only slightly greater than that for those done in one stage the conclusion is probably justified that the larger and more difficult bilateral hernias should be repaired in two operations. This statement is made because, in the cases studied, repair in two stages was largely done. Only slight increase in the recurrence rate was found, although the majority of hernias operated on in two stages were certainly associated with a greater expectation of recurrence than those repaired at one operation.

However as in deciding upon the length of time a patient should be kept in the hospital after the operation, the economic factor must necessarily be taken into account. The patient's ability to pay for two periods of hospitalization instead of one, and to be away from work for two periods instead of one should probably be the determining factor unless both hernias present unusual obstacles to the performance of satisfactory repair. In this case the

repairs should be performed at two operations preferably with two separate admissions to the hospital.

For those bilateral hernias in which it is necessary to be repaired at one operation, an extended stay in bed will to a certain degree limit the expected increase in the recurrence rate.

Both incarceration and strangulation increase the expectation of recurrence by from 30 to 100 per cent and give mortality rates eight and eleven times greater respectively. It is obvious that incomplete indirect inguinal hernias should be operated on early before either of these complications develops.

Meticulous care should be used in the performance of the operation to prevent wound infection and hematoma, particularly since the former gives a recurrence rate of three times the average for the entire group.

Pulmonary and circulatory complications can be kept to a minimum by careful administration of a properly selected anesthetic, maintenance of passive and active motion of the patient's muscles, and frequent changes of the patient's position in bed post-operatively. Rigid refusal to operate on patients having even the slightest evidence of common cold will add materially in the reduction of respiratory complications. These points are all very important, as both the mortality rate and the recurrence rate are increased by respiratory complications. Circulatory complications also increase the mortality.

The type of repair must be chosen for each individual hernia. There are so many factors involved that it would be irrational to conclude that because one type of operation resulted in a low recurrence rate (in sets of figures such as those given in one of the author's tables) this type of repair should be applied to all hernias. These figures justify the statement that adding suture of the rectus muscle or of the anterior sheath of the rectus muscle to any type of repair of an incomplete indirect inguinal hernia is not a satisfactory procedure. Probably transplantation of the cord external to the external oblique aponeurosis does not give as satisfactory results as does the Bassini type of transplantation. However the possible inclusion of a greater percentage of difficult repairs in this group may have accounted for the increase in the recurrence rate of nearly 5 per cent. The figures obtained would indicate that the Balfour-Andrews type of repair is an unnecessary addition to the required operative manipulation, although the number of cases in this group was too small to give definite proof. For the larger hernias, for those in patients with poor structures, and in those in which there is definite direct weakness, the figures indicate that the use of fascial suture after the technique of McArthur gives slightly lower recurrence rate than that achieved without its use in a group of hernias in which supposedly a lower recurrence rate is more readily obtained.

In all cases in which the patient's financial circumstances permit, hospitalization for a minimum of sixteen days will be repaid by a decrease in the expected rate of recurrence. In the case of hernias which are large or bilateral, or which present other factors increasing the expectancy of recurrence, a minimum period of three weeks' hospitalization should be provided for. SAMUEL H. KLEIN, M.D.

GASTRO-INTESTINAL TRACT

Holman, C. W., and Sandusky, W. R. Further Observations on the Diagnosis and Treatment of Gastric Lesions. *Ann Surg*, 1940, 112: 339.

This report is based upon a series of 53 patients with ulcer of the stomach and 104 patients with carcinoma of the stomach who were studied thoroughly, operated upon, and then followed up post-operatively.

The results of this study showed that in many instances a correct diagnosis cannot be established by any of the diagnostic measures at present available, and were strong evidence favoring the removal of all gastric lesions, if possible, when surgical therapy is undertaken. Of interest was the fact that all patients with benign ulcer which were studied had an acidity which was normal or higher. The comparative value of various diagnostic procedures showed approximately a 15 per cent error in diagnosis when any one of the diagnostic procedures was used alone. However, when all the accumulated evidence was weighed, the error in diagnosis decreased considerably. The character and duration of the symptoms and age of the patient varied so greatly both in ulcer and cancer that their practical diagnostic value was minimal. Roentgenological examination was not conclusive in 33 of 157 patients with gastric lesions. The surgeon was unable to differentiate between a benign and malignant lesion in 23 of 157 patients even by inspecting and palpating the lesion during the operation.

Since there is considerable possibility of error in diagnosis, the treatment of choice becomes surgical excision. The argument against partial gastric resection is a prohibitive operative mortality. This was not supported by the results obtained in this group of patients. Forty-seven patients had either wide excisions or partial resections with 3 deaths, a mortality of 6.3 per cent.

SAMUEL J. FOGELSON, M.D.

Robinson, S. C., and Brucer, M. The Body Build of the Male Ulcer Patient. *Am J Digest Dis*, 1940, 7: 365.

This study was prepared in order to determine whether there is a body habitus characteristic of the ulcer patient. Two hundred and fifty male patients with ulcer were studied and compared with a large control group of 7,478 men.

Measurements were made on the nude subject in both the ulcer and unselected groups. The height was measured to one tenth of an inch on a specially

constructed platform. Chest and abdominal circumferences were measured with a steel tape just above the nipple line and at the umbilicus or maximum protuberance. The weight was recorded on a beam scale. The "raw" measurement of weight does not accurately measure the relative under-weight or obesity of a person. For this reason the "ponderal index," which is weight divided by height, more accurately measures the weight factors in that it establishes a more true normal weight and more quickly shows either the presence or absence of obesity.

The mean ponderal index of the ulcer group was 2.15 ± 0.019 , while the unselected group had a mean of 2.31 ± 0.004 . Further studies of this type showed that the patient with ulcer was found to differ from the control group in every measurement except height. The patient with ulcer tends to be normal or under-weight, his chest circumference is smaller than that found in the unselected population, his abdominal circumference at the level of the umbilicus also is smaller, and his body build shows him to be of a slender, narrow, or linear type build. There is little tendency toward abdominal protrusion. There is a smaller surface area, and the systolic blood pressure tends to be lower. The diastolic blood pressure shows no significant difference, being only slightly lower in the patient with ulcer than in the unselected group of men.

SAMUEL J. FOGELSON, M.D.

Walters, W. Cardial Gastric Ulcers, Results of Operation for Apparently Inaccessible Lesions. *Arch Surg*, 1940, 41: 542.

As a result of a better understanding of gastric ulcers and their earlier recognition, when the lesion is still small and without the complicating features of hemorrhage, perforation, and obstruction, relief of symptoms and healing of the ulcer have resulted from a medical regimen in more cases recently than many years ago. The only objection to a medical regimen in all such cases is that in some of them the lesion, instead of being a small gastric ulcer, is in reality ulcerating carcinoma.

The incidence of malignant change in gastric ulcer has been stated to be from 10 to 20 per cent. The possibility of healing a large gastric ulcer with a crater 1.5 cm. or larger in diameter by other than surgical methods should be looked on with skepticism, for all such ulcers have a tendency to perforate. Surgical removal relieves the menace of fatal hemorrhage from the lesion, or of an acute perforation which may require emergency procedure for its closure. Of great importance is the removal of a lesion which may be malignant or may become so. The risk of operation for gastric ulcer should not exceed 5 per cent, and it is possible to operate on a large series of patients with gastric ulcer with an average mortality rate of considerably less than 5 per cent.

In experience at the Mayo Clinic the large gastric ulcers are most frequently present along the lesser

curvature of the stomach, slightly posterior to it. In several of the cases at the clinic the ulcer appeared on roentgenological examination to be located very high on the lesser curvature, and for this reason it was thought that operative removal would be difficult, operation disclosed, however, that perforation of the lesion to the capsule of the pancreas had given an erroneous idea of the amount of stomach between the ulcer and the esophagus. In these cases there was actually much more uninvolved stomach than the roentgenogram indicated. On other occasions, the early division of the gastrohepatic omentum at a very high level assisted in mobilizing the upper part of the stomach so that unusually high lesions could be removed without too great difficulty.

As experience develops, more high gastric lesions will be found to be resectable.

Abbreviated reports of 6 cases were selected, not to demonstrate any special point, but because they illustrated characteristic lesions of the types under consideration.

Seventy-six, or 14 per cent, of the 543 gastric lesions for which operation was performed at the Mayo Clinic during 1935 and 1939 were found to be at or higher than a point midway between the angle of the stomach and the esophagus. In 35 of these 76 cases benign gastric ulcer was present. In 40 of the 35 cases of benign gastric ulcer situated high above the incisura angularis of the stomach partial gastric resection was performed with death. There were 34 cases of carcinoma in which the lesion was situated high above the incisura angularis of the stomach, some form of gastric resection (partial or total gastrectomy) was done in all but 1 with 5 deaths. In 7 cases miscellaneous benign lesions were removed by local excision without mortality.

Frequently the high gastric lesion appeared higher in the roentgenogram than it actually was, because of foreshortening of the stomach proximal to it, caused by perforation of the ulcer out the pancreas or into the gastrohepatic omentum. In most such cases ample stomach could be found above the lesion for safe partial gastric resection after mobilization of the stomach and its perforating process and by high ligation of the gastrohepatic omentum.

Partial or subtotal gastrectomy was preferred for the surgical treatment of cardiac gastric ulcer. When the condition of the patient did not allow this, excision of the lesion with or without gastro-enterostomy was favored. When the ulcer could not be excised with safety because of its proximity to the esophagus or because of the poor condition of the patient, gastro-enterostomy was preferred, inasmuch as high incidence of relative achlorhydria and healing occurred after such procedure. The Kling-Madlener palliative gastric resection in which the ulcer is not removed has not been utilized by the Mayo Clinic.

The difficulty of differentiating malignant from benign ulcerative process in the cardiac gastric region by roentgenological examination was emphasized.

Seanders, J. B. deC. M. and Lindner, H. H.: Congenital Anomalies of the Duodenum. *Ann. Surg.* 940 3

Congenital anomalies of the duodenum are relatively rare but the authors have encountered 3 cases in which there was an opportunity to examine and study them in some detail.

In the first case newborn male child, eighting 7 lb. 10 oz. was delivered spontaneously with marked jaundice. The infant nursed poorly and on the third day vomited large quantities of sour-smelling food. There was a large brownish yellow stool. Vomiting continued from the third to the seventh day. The intensity of the jaundice increased and weight loss was marked. A pre-operative diagnosis of pyloric spasm or stenosis was made. After pre-operative supportive measures, operation as performed. The liver was of normal size. The transverse colon was absent from its usual position below the greater curvature of the stomach, being replaced by coils of small intestine. The colon was found accreted on the left side, which indicated non-rotation. The pyloric region was obscured by a persistent hepato-duodenal ligament. On division of the peritoneal ligament, the duodenum was found matted together by adhesions in the form of an S-shaped loop and fused with the greater curvature of the stomach below the pylorus. On further dissection, the curvature of the duodenum was restored, it was found to be unfixed, suspended by mesoduodenum. A stenotic area, three-quarters of an inch long and reducing the bowel caliber to one-eighth of an inch, involved the proximal segment of the second and distal portion of the first part of the duodenum. On longitudinal incision of this area, a lumen the size of a pencil lead was encountered. The openings of the pancreatic and biliary ducts were not observed. The diameter of the lumen was widened by closure of the incision transversely and the lumen was now judged to be of adequate size. After closure, the child was returned to bed in fairly good condition. The immediate postoperative course was uneventful. However fifteen days after operation the child died suddenly after convulsion. Autopsy was refused.

In the second case female white child of seven and one-half years was brought to the hospital because of frequent and persistent vomiting since one month following birth. The vomiting was projectile in type and followed each feeding. At fifteen months of age the child was diagnosed as suffering from congenital hypertrophic pyloric stenosis and was operated on with the finding of wide open gaping pylorus. There are many well-known diseases from the gall bladder to the duodenum, large mesoduodenum, and uniform collapse of the distal two-thirds of the duodenum and small intestine. A long Meckel diverticulum as present together with many enlarged mesenteric lymph glands. A diagnosis of tuberculosis of the bowel and mesentery was made. A barium meal was given at the University of California Hospital, and the pre-operative

diagnosis of congenital stenosis of the duodenum was made

At operation the entire small bowel distal to the ligament of Treitz was collapsed. The stomach was markedly dilated and extended downward into the pelvis. The stomach walls and the second part of the duodenum were dilated and hypertrophied. The cecum had not descended from under the liver and was suspended by a mesentery. On mobilizing the duodenum, a circular band was found to constrict the bowel four inches from the pylorus. An incision made over the point of constriction revealed a diaphragm almost completely occluding the lumen. The diaphragm was completely excised and the bowel closed in the Heineke-Mikulicz manner to prevent stenosis. The child did very well after operation. Vomiting ceased and the weight was normal two years after operation.

In the third case a female child of three weeks was admitted because of a large protruding umbilical mass and projectile vomiting of two weeks' duration. The umbilical mass, first observed at birth, steadily increased in size and became gangrenous. The child was badly emaciated and dehydrated. At operation, the protruding tissue was removed and granulations slowly formed in the area. The laboratory reported the presence of liver tissue in the excised mass. The child died four months later and autopsy was granted. Among other findings there was a marked duodenal anomaly present. The first portion extended horizontally to the right and was then abruptly reflected upon itself, in the form of a "U," to the region behind the pyloric antrum. It next ascended obliquely upward and to the right, making an abrupt flexure behind the liver to extend in a sharp curve downward and to the right and making still another flexure behind the first portion of the duodenum, then it passed horizontally to the left where it terminated in the duodenojejunal flexure.

Spriggs, in 1912, stated that congenital duodenal obstruction is not so very much rarer than imperforate anus as one might expect. The one affection, being so obvious, cannot be missed, the other most certainly is not so constantly in the mind of the practitioner and not so obvious, hence it often is missed. Congenital duodenal obstruction results from the effect of either intrinsic or extrinsic factors. The development of the duodenum, as observed from microscopic sections, is given as a basis for the classification of and the opinions concerning the genesis of these anomalies.

The treatment of congenital duodenal obstruction is essentially surgical and should be instituted at the earliest possible time compatible with the physical condition of the infant. Because of the smallness of the bowel in infancy, surgical procedures are often attended by great surgical difficulty. Multiple constrictions are relatively common. From a technical standpoint, it is important to employ extremely fine silk or linen as a suture material, and to perform the anastomosis with a single anterior and posterior

layer to obviate narrowing of the lumen. This technique will reward the user with a higher per cent of successful results. Early surgical diagnosis of the lesion and early surgical intervention are most important. It is perhaps the rarity of congenital obstruction which is responsible for the poor prognosis in the majority of reported cases and also for the relative therapeutic inertia. JOHN W. NUZUM, M.D.

Ward, R. Appendicitis with Complications. A Reduction in Mortality Due to the Use of Continuous Gastro-Intestinal Decompression. *West J. Surg., Obst. & Gynec.*, 1940, 48, 469.

Ward has made a statistical study of the cases of acute appendicitis from the wards of the University of California Hospital. During the period from 1913 to 1925 there were 206 patients operated on for acute appendicitis with 12 deaths, a mortality rate of 5.8 per cent. This was before the introduction of gastro-intestinal decompression.

In contrast, during the period from 1925 to 1939, a group of 561 patients were operated on for acute appendicitis with the advantage of decompression of the gastro-intestinal tract by means of the Levine nasal tube. In this group there were 17 deaths, a mortality of only 3 per cent. The writer believes that transduodenal decompression was the most important factor in the lowering of the mortality rate.

In the total series of cases there were 462 patients with simple non-perforated appendicitis. In this group there were 3 deaths, a mortality of 0.65 per cent. There should be no deaths in simple non-perforated appendicitis.

In the group with appendicitis with perforation and localized peritonitis, there were 21 patients who did not have the advantages of decompression. Three of these patients died, which gave a mortality of 14.3 per cent. At the same time there were 41 patients with similar pathology who had surgical decompression along with the operation. Only 2 of these died and the mortality was reduced to 5 per cent.

In a group of 10 patients with perforated appendicitis and diffuse peritonitis there were 4 deaths, a mortality of 40 per cent. In a group of 22 patients with similar pathology receiving decompression, there were 6 deaths, a mortality of 27.2 per cent.

The author has devised a plan of management along the line suggested by the Horsleys.

Rule I. Operate for appendicitis when the diagnosis of appendicitis is first made or strongly suspected. An exception is made in the presence of a diffuse peritonitis or if the patient is moribund. This patient is to be treated by the immediate institution of intestinal decompression with the nasal tube, the restoration of fluid and of electrolyte balance, and the use of Fowler's position with morphine. He is to be prepared for later operation.

Rule II. Under spinal or local anesthesia, approach the appendix through a gridiron incision located over the suspected site of the appendix. Remove the appendix with the cautery, with continuous

evacuation of pus or serous fluid by suction, and with a minimal disturbance of the surrounding structures. Close the stump by simple ligation or inversion without ligation if the cecal wall is not indurated. Close the abdominal cavity without drainage, unless a well walled-off abscess has been found.

Rule III. Drain the abdominal wall adequately in all infected cases, or pack the wound open with vaseline gauze if contamination is great.

Rule IV. Treat the patient postoperatively by intestinal decompression and do not wait for distention to develop. Give morphine for pain and bowel discomfort. Maintain the fluid and electrolyte balance but withhold food and fluids by mouth until normal peristalsis has returned. Use no artificial stimulants to peristalsis.

A short résumé of the case histories of the 20 patients in this group who died from complications is appended. JOHN W. NORRIS, M.D.

Howard, R. N. Portal Pyemia Following Acute Appendicitis; A Case of Multiple Liver Abscesses with Recovery. *Australian & New Zealand J Surg* 1930, 3:31.

The author believes that the successful outcome of case of portal pyemia with multiple liver abscesses seems worthy of note, since it is generally believed to be a universally fatal condition in the more acute forms. However an extensive perusal of the literature showed this belief to be incorrect.

The author reports the case of a boy aged seven years who was admitted to St. James Hospital, London, on October 1935, with sixty-hour history of acute appendicitis. The temperature was 101.4 F. The pulse rate was 6 and the respiration rate 20. The lower abdomen was tender and rigid.

The first operation was done under ether anesthesia on October 1935. Through a muscle-splitting incision, gangrenous retrocecal appendix was removed. Lower abdominal peritonitis with much purulent fluid was present. A drainage tube was placed in the pelvis through a suprapubic stab wound. The incision was closed with drainage of the subcutaneous tissues. Both drainage tubes were removed in forty-eight hours. Gross infection of the wound developed. The temperature rose to 101.4 F at night for the next two weeks. It subsided by lysis during the third week only to rise again and become irregularly remittent and intermittent. There followed week of normal temperature without clinical improvement. The wounds were now healed. The patient was pallid and listless. The hair began to fall out. Examination revealed tenderness of the upper part of the abdomen.

On December 4, 1935 the patient complained of chilly sensations but the temperature was normal. Three days later the temperature rose to 103 F and further chills were experienced. At this time physical examination revealed fullness and tenderness in the upper abdomen with dullness to percussion. Breath sounds were diminished at the right

base. X rays revealed uniform elevation of the right half of the diaphragm with diminished respiratory excursion. A probable right posterior intraperitoneal subphrenic abscess was diagnosed. The leucocyte count was 35,000 per c. mm. The patient's general condition was poor.

The second operation was performed December 26, 1935. Under gas-oxygen anesthesia transverse muscle-cutting incision was made at the tip of the eleventh rib, and one of four pus were evacuated from the right posterior intraperitoneal space. The liver as enlarged but the surface appeared normal. A drainage tube was placed in the abscess cavity. The temperature dropped following operation but there was no improvement in the patient's condition. The liver enlarged to occupy the upper part of the abdomen. The general condition became desperate and ascites developed. The leucocyte count was now 46,000 per c. mm. X rays revealed further elevation of the right diaphragm with complete immobility. A diagnosis of suppurative pyelophlebitis with intra hepatic abscess formation was made and third operation decided upon.

On January 7 1936, the third operation was performed under gas and oxygen anesthesia supplemented by local infiltration with novocaine solution. The subphrenic area was needled through the lower right intercostal spaces posteriorly but no pus was obtained. Two inches of the tenth rib were resected in the scapular line and the pleura was opened in the phrenicocostal sinus. A large amount of serous fluid was evacuated. The diaphragm was sutured to the pleura, incised across its fibers, and the liver exposed. Pus was found. The right lobe of the liver was needled and bile-stained pus was obtained to depth of 1½ in. A cavity the size of tennis ball was drained in the right liver lobe. Much bile-stained pus effused out and a rubber drainage tube was inserted into the abscess cavity.

Following this operation the temperature fell and clinical improvement occurred. A complete biliary fistula now developed through the drainage tube. The stools are clay-colored. The fistula persisted after removal of the drainage tube on the seventh day. The patient's bile was collected and fed to him through a Ryle tube. Seven weeks later the fistula closed spontaneously. The liver was very large and ascites was still present.

A fourth operation was performed February 24 1936 through right upper paramedian incision. Both right and left liver lobes were needled extensively but no pus was found. The surface of the liver showed many elevated firm masses the size of hazelnuts. These were considered to be inspissated fibrous old abscesses and were not disturbed. Much clear ascitic fluid escaped from the abdominal incision.

Following this fourth operation, the patient began steady clinical improvement. The liver became smaller, ascites diminished, and his hair began to grow again. He was discharged on May 6, 1936, or 203 days after admission. When reexamined four months later the child was in good health.

Early removal of acutely inflamed appendices will prevent this serious complication. Sulfonamide therapy in some adequate form should be instituted immediately. With regard to late cases, sulfonamide should be given in maximal doses and surgical drainage instituted when necessary and possible.

The prognosis of portal pyemia should be greatly improved by early ligation of the ileocolic vein proximal to the clot. Liver abscess formation, while of serious import, is not necessarily fatal.

JOHN W. NUZUM, M.D.

Stone, H. B. **Surgical Problems in the Treatment of Chronic Ulcerative Colitis**. *Arch. Surg.*, 1940, 41: 525

The author remarks that there are varied opinions on the value of surgery in the treatment of chronic ulcerative colitis. Some clinics give the impression that the surgical intervention is a bad last resort. Other clinics and surgeons advocate the earlier employment of operative treatment. For a long time appendicostomy and cecostomy were advised in order to permit irrigation of the diseased colon from above downward. The failure of this idea has been generally admitted by surgeons experienced in this field. Such operations have been abandoned in favor of complete transverse ileostomy a short distance above the ileocecal valve. The principle of this operation is designed to put the large bowel completely out of function and give it physiological rest. Three results are seen from this operative intervention:

1. The colon may heal completely, and permit safe closure of the ileostomy opening.

2. The ileostomy may result in great improvement in the patient's general condition, but continued evidence of the disease in the large bowel remains. When this has been the result the ileostomy must remain permanent. The process is arrested but not cured. This is the course in the majority of patients.

3. The progress of the disease may not be arrested, and further bleeding, loss of weight, and anemia may occur and require resection of the colon.

The author advised the performance of ileostomy if irreversible pathological changes have taken place. Thus, the operative intervention must be done before the barium roentgen study of the colon shows loss of haustration, stiffening, and shortening.

The disadvantages of ileostomy are the need to care for the fecal discharges, the trouble of providing and wearing dressings or apparatus of some sort, and the disagreeable odor or fear of odor. Also a considerable prolapse of the ileum may occur with protrusion of a long piece of intestine, so that the treatment may be as bad as the disease. In the author's experience, later successful closure is possible only when the ileostomy has been employed early. The author suggests the adoption of the procedure described by Cattell, who draws out the stump of the ileum several centimeters beyond the level of the abdominal skin and fixes it there, so that the stump

may be inserted into a rubber bag which can be worn during the day. This avoids soiling and irritation of the skin. The author also presents a new operative procedure, which he says will prevent prolapse of the ileostomy as well as provide a trap for the peristaltic waves. In this procedure the ileum is doubled back on itself for a distance proximal to the stoma. An opening is then made between the two opposing loops, so that one large cavity is produced.

When the colon approach is normal the ileostomy may then be closed. The author uses as a guide for the possible closure of the colostomy, the microscopic appearance of the returns of an enema of 1 liter of physiological solution of sodium chloride. This is centrifuged and the sediment thrown down microscopically. The number of red corpuscles and leucocytes give evidence of the amount of active inflammatory process present in the bowel.

WILLIAM C. BECK, M.D.

Norbury, L. E. C., Ogilvie, W. H., Gabriel, W. B., Hurst, Sir A., and Others. **Discussion on the Surgical Treatment of Idiopathic Ulcerative Colitis and Its Sequelæ**. *Proc. Roy. Soc. Med.*, Lond., 1940, 33: 637

Norbury says there is no doubt that a certain percentage of early cases of non-specific ulcerative colon proctitis can be cured or relieved by medical means alone. In a larger number of cases, however, the disease becomes chronic or progresses with greater or lesser rapidity toward death.

Surgical treatment may be divided into (1) methods employed primarily for purposes of colon irrigation, namely appendicostomy and valvular cecostomy, (2) methods directed to the exclusion of the colon from the passage of feces by means of a terminal ileostomy, and (3) ileostomy followed by colectomy with anastomosis of the ileum to the rectum, or ileostomy followed by excision of the colon and rectum.

The author's experience has been chiefly confined to appendicostomy. Of 27 patients on whom appendicostomy was performed in the past ten years, 4 died from twenty-six days to six months after operation. The general health of the remainder steadily improved, as evidenced by gain in weight and the sigmoidoscopic appearance of the colon. The latter improves more slowly than the general condition of the patient.

High colonic lavage *per rectum* is definitely dangerous in the presence of ulcerative colon proctitis, and does not actually traverse the colon as shown by roentgenograms. With an appendicostomy the patient can irrigate the colon himself.

Appendicostomy can be done expediently under local anesthesia, through a muscle-splitting incision. A well fashioned appendicostomy has no tendency to close spontaneously, but cicatricial contraction can be obviated by regularly passing a catheter.

Two pints of normal saline solution morning and evening are usually used for irrigation of the colon. Warm olive oil can be instilled at night and washed

out in the morning by the saline enema. Irrigations may have to be employed for months or even years in some cases.

Blood transfusion is of great value.

Cecostomy is performed when the appendix is unsuitable for appendectomy or when it has been previously removed. This may be of the Senn type, as devised for gastrostomy or after the method of Witzel.

Ileostomy is indicated in severe cases with marked general symptoms, *ft remia*, abdominal tenderness and distention, profuse discharge of pus *per rectum* and extensive ulceration as shown by sigmoidoscopy, also when appendectomy has failed.

Cecostomy appears unnecessary in the early stages and dangerous in the later according to this author. Appendectomy is a valuable adjunct to medical treatment.

Ogilvie believes that the surgery of ulcerative colitis is essentially destructive. It is best used when medicine has failed, and has no place as an adjunct to medical treatment. Neither appendectomy nor cecostomy offers better results than medical treatment alone.

Absolute indications for operation include stricture of the colon, polyposis and fistulas particularly in the ischio-rectal fossae.

Pre-symptomatic indications for operation include repeated severe hemorrhage, constant blood loss of lesser degree, continuous bed confinement for year, fourth relapse in spite of intervals of reasonable health, and a segmental distribution particularly if it involves the proximal colon only.

Contraindications to operation consist mainly of the fulminating type of case. Even though an ileostomy is well tolerated under local anesthesia, it does not prevent death from toxic absorption.

The surgical treatment as carried to completion in a small number of cases consists of three stages: excision (ileostomy), excision (resection) and restoration (ileosigmoidostomy).

This author has treated 7 cases of ulcerative colitis radically with 7 deaths. Five patients died after ileostomy, 3 of these had the fulminating type of colitis with few weeks history, died of ileus, and the last died of ulceration of the ileum ten weeks after operation. Of the remaining one died after colectomy and the other from peritonitis following ileosigmoidostomy. The living patients are all in good condition. 8 have permanent ileostomies and have the ileum re-implanted in the pelvic colon.

Washing out of the colon is unnecessary for the colon recovers so rapidly that washing out is superfluous and tends rather to favor the absorption of toxins. Thus, single-barrelled ileostomy is done. The discharge from the ileum is at first continuous and liquid, but the fluid loss is made up by an increased intake and more than compensated for by the rapid disappearance of toxemia. Within two or three weeks the efflux is less liquid, and the three to six months it becomes semi-solid, and is passed

at intervals of from three to four hours. Before the efflux becomes solid, irritation of the skin can be prevented by aluminum paste. Later only colostomy belt is necessary.

Gabriel states that according to Linn, experimental colon explants in dogs, spasm may be the chief cause of ulcerative colitis. If his views are correct, we have an added reason for advocating the need of early treatment before prolonged spasm produces irretrievable damage. At this stage medical treatment is of paramount importance.

Surgical treatment is indicated (1) when in spite of bed rest and careful medical management the patient's condition gets worse, with loss of weight and strength; (2) when there are repeated hemorrhages; (3) when signs of toxemia persist (thirst, an evening temperature up to 101 or 102, dry tongue, and a rapid pulse, despite medical management); (4) when there are exhaustingly frequent stools; and (5) in the fulminating type of case.

Appendectomy is the safest, earliest, least mutilating, and most rational surgical treatment, particularly in young subjects, and should be done before the disease has advanced too far.

Of 5 patients treated by appendectomy 3 died in the hospital. His no relief from symptoms. 1 of these the condition was very acute. There are very good results with follow-ups ranging from six to nine years. Three cases are improved, but later untraced.

Hurst believes that Linn's theory that spasm causes ulcerative colitis is untenable. On the other hand, he states that ulcerative colitis, in common with diverticulitis of the colon, frequently gives rise to spasm.

In support of his belief that proper medical management can be very successful, the author shows the results of 85 cases treated medically. These cases received medical treatment from one to twenty years prior to 1937. Of 85 patients, 77.6 per cent were quite well, 6 per cent were not ill but showed improvement in their condition, 2.4 per cent were ill, and 0.4 per cent had died.

When ileostomy the operation of choice, is done each case must be judged on its merits before a decision is made to keep the opening permanent. Before closure of an ileostomy the bowel is trained for several weeks by the injection of some of the feces discharged from the ileum through the distal ileostomy opening. The feces are first diluted with water and gradually made stronger until finally the whole of the ileal contents are injected undiluted. If there is no untoward reaction it is safe to rejoin the dilated ileum. If, however, the disease is of long standing and strictures or polyps are known to be present, an ileosigmoidostomy should be performed instead. It is generally unnecessary to excise the excluded part of the colon.

If pus and blood are still being excreted *per anus* one year after ileostomy the colon should be excised to about 9 in from the anus. The remaining colon can then be treated and brought into suitable

condition in order to have the ileum joined to it after a period of several months. If, however, this should not be done, the remaining part of the pelvic colon and rectum can be excised.

Lockhart-Mummery gave his own figures as follows of 44 patients treated by appendicostomy for ulcerative colitis, 21 were cured, 16 were relieved, and 7 died (4 deaths occurred in children under twelve years of age). Of 4 treated by cecostomy, 1 was cured, 1 was relieved, and 2 died. This author's opinion is that appendicostomy plays a very useful part in the treatment of ulcerative colitis.

Corbett says that although satisfactory results follow appendicostomy for ulcerative colitis, it is possible that some of the patients would have recovered without it. Of the 20 per cent who died, perhaps a considerable proportion might have survived if terminal ileostomy had been done.

A terminal ileostomy is considered better than an ileostomy in continuity, or double barrelled ileostomy. Corbett protects the skin around the opening by keeping the bowel closed for from twenty-four to forty-eight hours, if possible, inserting a Paul's tube, and protecting the skin with zinc cream or *tulle gras*.

Smyth saw 2 cases of ulcerative colitis in patients under twelve years of age. Cod-liver oil emulsion cannot be made to reach the cecum satisfactorily when injected into the rectum. Therefore an appendicostomy or cecostomy is of great help in cleaning out the colon.

Patterson reported his experience with 48 cases of ulcerative colitis, 9 of his patients died. Eight had had operations and 1 of these died after colectomy.

Vaizey and Butler reviewed the results of treatment of ulcerative colitis in 89 patients. There were 30 males and 59 females. Nine were under twenty years of age, 47 between twenty and forty, 27 between forty and sixty, and 6 more than sixty years of age. The youngest was eleven, the oldest seventy.

The immediate mortality, up to one year after operation, was 17 per cent. Five more patients died within three years, 2 in from three to ten years, and 4 more than ten years after operation.

Fifty-two patients are known to be alive, 29 of whom were reexamined. Five were completely well, 8 had relapses from time to time, 8 had chronic diarrhea, 3 had rectal stricture, and 3 were ill and weak. Including reports by mail, only 10 of 81 followed up really had a lasting symptomatic cure.

Of 26 patients operated upon, 16 had appendicostomies, 4 had cecostomies, 3 had colostomies, 2 had ileostomies, and 2 had exploratory laparotomies. The operative mortality was 10 per cent, and there were 16 recoveries.

HAROLD LAUFMAN, M D

Miller, E. M. Gangrene of the Sigmoid Flexure of the Colon Due to Volvulus, Recovery of a Child, Spontaneous Anastomosis Between the Descending Colon and the Rectum. *Arch Surg*, 1940, 41: 403.

The author reports a case of spontaneous anastomosis between the descending colon and the upper

part of the rectum, occurring in a twelve-year-old girl who recovered from complete gangrene of the sigmoid flexure due to volvulus. One of the predisposing causes of volvulus is an abnormally long mesentery combined with a narrow base between the afferent and efferent loops. Contributing factors include the presence of adhesions and tumors in the mesentery or howel, and constipation.

A diagnosis of ruptured appendix with peritonitis was made, based upon the history of an acute onset twenty two hours before admission, and the symptoms which consisted of nausea, vomiting, abdominal pain, and fever. Because of dehydration and abdominal distention, fluids were administered and continuous duodenal aspiration was instituted, morphine was given because of discomfort. A roentgenogram revealed a greatly distended loop of large bowel.

When the abdomen was opened through a right rectus incision, foul smelling, blood-stained fluid escaped. The entire sigmoid flexure was found to be twisted, distended, and gangrenous. The gangrenous loop extended so far into the depth of the left flank that resection would have been impossible even if the patient's condition had permitted it. The gangrenous sigmoid was exteriorized and slowly deflated of gas and fecal contents by means of a large syringe.

Although very little hope for recovery was entertained, the patient rallied after the operation, and the gangrenous bowel was gradually trimmed from day to day. One month later the patient passed a normal stool by rectum and continued to do so each day thereafter, while less fecal material was passed from the abdominal wound.

Six weeks after operation a lateral anastomosis between the descending colon and the rectum was done through a clean left rectus incision, in order to more completely reestablish the continuity of the bowel. Progress thereafter was very rapid and the patient was finally discharged perfectly well, the original wound having closed completely.

The advisability of being conservative at the initial operative procedure in the presence of such extensive gangrene is emphasized.

HAROLD LAUFMAN, M D

David, V. C. Some Etiological and Pathological Factors in Cancer of the Large Bowel. *Arch Surg*, 1940, 41: 257.

Studies on material covering 200 resected cancers of the large bowel and 100 specimens of supposedly benign polyps of the colon and rectum were carried out to call attention to the frequency of occurrence and the histological structure of such tumors.

The incidence of mucous polyps varies and depends upon whether the polyps are discovered as a result of examination of patients complaining of symptoms, or whether they are looked for at necropsy. One of the most common deviations from normal in the mucosa of the colon is the occurrence of flat elevations of the size of a millet seed. These are usually multiple and occur in old persons, perhaps another example of senile hyperplasia of

epithelial surfaces. They may also occur as an inflammatory lesion in colostomy openings or near ulcerating carcinomas of the bowel. Histologically they are simple hyperplasias with inflammatory reaction.

The type of tumor next in frequency is the adenomatous polyp. It varies in size from that of a pea to that of a large cherry and may have sessile attachment or pedicle. These polyps are transparent or have the same color as the mucosa, in which instance the epithelium is akin to normal and the body of the polyp contains sparse epithelial elements, many of which are cystic. There may be considerable inflammatory infiltration.

Other polyps of this adenomatous group vary almost insensibly from the type described, the polyps which have every evidence of growth or tumor change in their epithelium. The results of the author's study convinced him that there was a gradual transition of these polypoid growths from hyperplasia to adenoma formation. The most convincing evidence of a malignant tendency of these polyps is the actual carcinomatous change in lesion, the major part of which is benign from both gross and histological viewpoint.

Another type of benign polypoid tumor of the large bowel is the papilloma or villous tumor. These as a rule are large, extending on the average perhaps 3 or 4 in. above the surface of the bowel. These may produce obstruction, serve as the apex of an intussusception, but their most common symptoms are hemorrhage and the excretion of large amount of mucus. If not removed completely they will recur locally even though the recurrence is benign. In 7 cases an early carcinoma was seen beginning in such lesion. Malignant changes usually begin in the center of these tumors. They resemble carcinoma grossly more than any other benign polypoid tumor.

Multiple polyps is another condition presenting strong evidence of a definite relationship between benign polyps and carcinoma. Not infrequently three or four of these may show carcinomatous degeneration, each surrounded by many benign polyps.

The small and large lymph polyps lack carcinomatous tendencies but grossly resemble other polyps.

That inflammation has some influence on epithelial changes in the large bowel is evidenced by the tumor-like tags occurring at the margins of long-standing amebic ulcers and histologically showing reduplications of the epithelial elements and even typical adenoma formation. These changes are seen mostly at the periphery of the adenoma. In no case of the adenomas examined could invasion be said to have taken place, but in certain fields in these polyps were compared to fields in proved carcinoma. It would be difficult to distinguish between them. This emphasizes anew the importance of examining the whole tumor.

Carcinomatous changes in these lesions can be safely diagnosed only by gross evidence of induration or ulceration and by histological evidence of inva-

sion of the tumor cells into the muscularis mucosae. While many polyps remain benign for years they cannot be trusted to do so and should be removed thoroughly, locally if benign, and radical if evidence of malignancy exists. The earliest carcinomas the author has seen in the large bowel are ulcerating lesions on polyps from 1 to 2 mm. in size.

HAROLD LUTYK, M.D.

Collier F. A., Kay E. B., and Macleay R. E.: Regional Lymphatic Metastases of Carcinoma of the Rectum. *Surgery* 1924, 8: 194.

A study was made of meta tests from carcinoma of the rectum and rectosigmoid: the regional lymph nodes in 55 specimens, and an average of 65 nodes per operative specimen, are isolated and examined microscopically. The lymph nodes are directed from each specimen after they had been localized by clearing with the Spalteholz method as modified by Gilchrist and David. They were charted and the results correlated with various physical findings of the associated primary lesion.

According to the classic description of the lymphatic spread of carcinoma of the rectum by Miles, three collecting systems are present: the superior, the lateral, and the inferior routes of lymphatic drainage corresponding to the superior, middle and inferior hemorrhoidal veins and classified by Miles as the extramural lymphatics into which the intramural and intermediary systems drain. The intramural lymphatics consist of two freely communicating networks located within the wall: one the submucosal, and the other the intermuscular network. The tendency of carcinoma to spread through the submucosal network does not appear to be common as the tendency to spread by the radial channel into the deeper intermuscular network. The main avenue of dissemination, however, is through the external muscle coat: the intermediary system, which consists of two parts, subserous network in that portion of the rectum invested with peritoneal covering, and lymph sinuses, situated between the external muscular coat and the peritoneal fat in that part of the rectum beneath the peritoneal reflection. The third lymphatic system, and the one which is most important surgically, is the extramural.

In untreated cases and in those which have recurrences, it is not uncommon to find carcinomatous nodules in the perineum, rectovaginal septum, and ischio-rectal fossa. Consequently operative removal should include the excision of the perineal skin, ischio-rectal adipose tissue, and levator ani muscles.

In the thorax material, lymph nodes were found in the site of metastases in 64 per cent of the carcinomas of the rectum and 5 per cent below the region of the blood vessels. The age of the patient had no important influence on the presence of metastases in the lymph nodes as 70 per cent of the patients less than fifty years of age and 60 per cent of those more than fifty years had metastases. A comparison of the incidence of metastases in carcinoma of the rectum classified according to the gross char-

acteristics of the carcinoma, such as sessile, excavating, and polypoid, showed that 80.9 per cent of the sessile type had produced metastases, on the other hand, only 33 per cent of the excavating and 53.5 per cent of the polypoid neoplasms had produced metastases. The only lesions causing involvement of the lymph nodes along the lateral zone of spread were those arising between the mucocutaneous junction and a point 3 cm above it. In no instance was retrograde metastasis found at a significant level below the primary lesion. No relation was found to exist between the size of the tumor and the presence of metastases in the lymph nodes. No correlation was found between the size of the lymph nodes and the presence in them of metastases. If the lesion had infiltrated through the wall of the rectum, the lymph nodes were involved in 90.9 per cent of the cases while those lesions that were still confined to the wall had caused metastases in the lymph nodes in only 43.3 per cent of the cases. As far as could be determined, 28 per cent of the neoplastic lesions developed in polyps and another 41.5 per cent of the specimens had benign polyps present. Neoplasms arising on the anterior wall had the larger percentage of lymph-node metastases.

Involvement of the lymph nodes and operability are not dependent on the duration of symptoms. Surgical procedure should not be based solely on the histological grading of the biopsy specimens.

The prognosis in any case can be made more accurately by an examination of all of the lymph nodes.

In spread of carcinoma along any zone of diffusion the nodes are not necessarily involved in continuity but may be involved at some distance with normal nodes intervening between the primary site and the metastases.

JOSEPH K. NARAT, M D

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Ravdin, I S. *The Protection of the Liver from Injury*. *Surgery*, 1940, 8: 204

The main reason for the protection against hepatic injury following a high carbohydrate diet is probably the reduction in the lipid content of the liver which results from such a diet. Under certain conditions, such as inanition, the administration of carbohydrate probably also protects the liver by virtue of its protein sparing action. Thus the protective action of carbohydrate is an indirect one.

The increased susceptibility of the liver of the starved animal is due to its depleted protein stores. The question of protein storage in the body, following the administration of a diet high in protein, is of particular importance if the protection conferred by such a diet is due to the protein *per se*. Whether the protein is stored in the sense that carbohydrate and fat are stored in the liver, or whether it is elaborated into hepatic or other tissue, it serves to protect the cells or replenish a structure which is being attacked.

From the author's data and the reports of others it has been found that a liver high in lipid content and low in readily available protein is maximally susceptible to chloroform, while a liver low in lipid content and high in readily available protein is maximally resistant to injury by this agent.

The presence of a high protein content in the diet makes it possible for considerable amounts of fat to be ingested and still reduce the original lipid concentration in the liver. These experiments point out the fact that diet and total caloric intake are important, for one without the other will not bring about the desired effects. In view of these data the intravenous injection of glucose appears to be inadequate for liver protection. Under the most favorable conditions of such therapy no more than 1,200 calories per day can be supplied and this cannot be continued over long periods. A high carbohydrate and high protein diet will prove to be more efficacious in conditioning the liver to minimal injury than will a high carbohydrate and low protein diet, or the intravenous administration of glucose with little emphasis on the oral intake of food.

The diet should be satisfactory not only from the standpoint of its composition, it should be administered in sufficient amounts to insure an adequate caloric intake. The two factors can be looked upon as acting synergistically. It is not possible to outline the diet, for this must be done after consultation between dietitian and patient. It should consist of approximately 70 per cent carbohydrate, 25 per cent protein, and not more than 5 per cent fat in its caloric composition. From 2,500 to 3,500 calories should be given for several days prior to operation and resumed as soon as possible thereafter. If necessary the orojejunal method of feeding may be carried out. Since the oral route is at this time the only one by which a satisfactory diet of adequate caloric intake can be given, it must remain the method of choice for the present. Only in those instances in which oral feeding is not possible should parenteral feeding be depended upon.

With such a program in the pre-operative and postoperative periods additional liver injury can be prevented, or minimized following anesthesia or operation. In addition, repair can be facilitated during the period of recovery.

MANUEL E. LICHTENSTEIN, M D

Berk, J E. *The Management of Acute Cholecystitis*. *Am J Digest Dis*, 1940, 7: 325

The management of acute cholecystitis occupies today approximately the same position occupied by the management of acute appendicitis some forty years ago. Opinion, both medical and surgical, is widely split into essentially two schools: one demanding that acute cholecystitis be considered as an intra-abdominal surgical emergency requiring operation as soon as possible, the other contending that in most cases the disease will subside, and that operation should be postponed until the interval or chronic stage after subsidence has occurred.

and entrance of this duct into the common duct. One should estimate the size of the duct and make a longitudinal incision in it not longer than the diameter of the duct itself. This wound is best held apart by fine silk guy sutures since these cause less trauma than instruments devised for this purpose. It is

wise to culture the bile that escapes from the open duct since subsequent infection if it should develop, may be more intelligently treated. The escaping bile should be picked up with a suction tip. The author found it of great advantage at this stage of the operation to go to the left side of the patient so that, by placing two fingers of the left hand in the foramen of Winslow, the region of the ducts could be palpated more satisfactorily. The ducts may be irrigated with normal salt solution after the gradual and careful dilatation of the papilla of Vater. The rationale of such a maneuver is based on the frequent findings of a very tight outlet and subsequent symptoms if dilatation has been omitted.

During the five year period between 1930 and 1935 395 ducts were explored of these, 231 had dilatation of the papilla of Vater while in 164 no dilatation was done. In the next four years 380 ducts were explored and dilatation of the papilla was carried out in all but 50 cases. The operative mortality averaged a little over 1 per cent greater in those patients not having dilatation of the papilla. Eight of the 56 patients having dilatation of the papilla came to secondary operation on the duct at some later period. In 4 of these, stones were again found in the ducts and in 2 the papilla was found to be the same size to which it had been dilated at the first operation. One other patient in this group had four attacks of biliary colic after leaving the hospital but has been symptom-free for a subsequent period of three and one half years. Among the 4 patients who did not have the papilla dilated, there were secondary operations and stones were found in 9. Ten other patients in this group continued to have symptoms indicative of stones or dyskinesia but they were not reoperated upon in this clinic. Thus there is this evidence that routine dilatation of the papilla reduces the chance of continued or recurrent symptoms from approximately 10 per cent to less than per cent.

Drainage of an explored duct is wise in all instances because of the difficulty of accurate closure of the incision in the jejunum duct without narrowing it. Also, it provides a safety valve to aid the control of liver decompression and gives some information regarding the character and quantity of the bile secreted. In routine cases No. 10 or French whistle-tipped catheter as found to be satisfactory. It should be of live rubber and the suture passing through it should not weaken the tube enough for it to break at the time of removal nor should the suture pass entirely through its lumen. In small ducts it is well to point the end of the tube toward the liver. In large ducts its direction is of less importance but there are some advantages in pointing it toward the duodenum, chiefly because in this direction it may

cause a lesser collection of debris in the current of bile and thereby enhance the passage of an over looked stone. It is well to establish drainage of the most dependent part of this region of the abdominal cavity by means of a cigarette wick or soft rubber tube, regardless of whether or not the common duct has been explored, although by taking great pains one may feel secure in many instances in not leaving a wick through the abdominal wall.

MAURICE E. LICHTENBERG, M.D.

Shumacker H. B., J. Acute Pancreatitis and Diabetes. *Ann Surg* 92, 177

A case of severe diabetes mellitus developing in the course of acute hemorrhagic pancreatitis is presented. Other instances of altered carbohydrate metabolism in acute pancreatitis are reported by the author.

The literature concerning changes in the carbohydrate metabolism in acute pancreatitis and diabetes as a complication or sequela is discussed. Glycosuria occurs in about 1 per cent of patients with acute pancreatitis. Hyperglycemia and decreased glucose tolerance occur in a much greater proportion of cases. Glucose tolerance is an important diagnostic test.

Diabetes may develop during acute pancreatitis. It may terminate rapidly in coma, or the patient may survive with persistent diabetes of greater or less severity. It may ensue after a few months or many years. At least 2 per cent of all patients with severe acute pancreatitis develop diabetes, and from 3 to 10 per cent of those surviving the acute illness develop this malady. A much larger percentage of surviving patients will have milder grades of altered carbohydrate metabolism. It seems unlikely that mild cases of acute pancreatitis would result in diabetes.

It is suggested that these features of acute pancreatitis be kept in mind in the management of this disease and that systematic follow-up studies be made.

CHARLES BABCOCK, M.D.

Greenlee, D. P., Lloyd, J. G., Bruckman, A. J. and McElroy W. M. Adenoma of the Islets of Langerhans with Hyperinsulinism, Associated with Adenoma of the Thyroid. *Ann. Surg.* 92, 373

The authors present a case of adenoma of the islets of Langerhans with hyperinsulinism, complicated with hyperthyroidism. This case has been thoroughly worked out from diagnostic standpoint. The patient was fifty-six year-old white female who had suffered from attacks of unconsciousness for a period of two and one half years, the attacks coming on most frequently before breakfast. The patient had discovered that the ingestion of food 1500 A.M. tended to vert the attacks. She had had goiter for twenty years, and recently there had been marked weight loss. Physical examination showed marked emaciation, an adenoma of the thyroid with signs of hyperthyroidism, and mild hypertension.

Laboratory examinations showed (1) the basal metabolism rate to range from +54 to +65, and (2) the blood sugar to be 34 mgm, 32 mgm, and 57 mgm. Other blood chemistry findings, including calcium, were normal.

It was decided to attack the thyrotoxic state first, since an acute hypoglycemic reaction could be controlled more easily than an acute hyperthyroid reaction. Accordingly, resection of the hyperplastic adenoma of the thyroid was carried out, the patient being given intravenous glucose continuously for the first twenty-four hours, later, glucose was administered intermittently. A marked improvement in general health followed this procedure, and the attacks of unconsciousness became less frequent. Further laboratory studies, including glucose-tolerance tests, were carried out.

Fourteen months after thyroidectomy the pancreas was explored and a tumor $1\frac{1}{2}$ cm in diameter was resected from the body of the pancreas, near the junction of the body with the tail. Glucose was administered during and after the operation.

Biological assay of the tumor tissue by injection of tumor tissue extract into a rabbit resulted in a marked fall in the blood sugar, with shock and convulsions. Intravenous glucose rapidly improved the condition of the rabbit and resulted in its recovery. A detailed pathological description of the tumor is given.

The patient made an uneventful convalescence, and since the operation, has been free from seizures.

After the detailed presentation of their case, the authors review the various aspects of hyperinsulinism, including the diagnosis, anatomical and surgical considerations, and certain general considerations.

LUTHER H. WOLFF, M D

Frantz, V K. Tumors of Islet Cells with Hyperinsulinism, Benign, Malignant, and Questionable. *Ann Surg*, 1940, 112 161

In the literature reporting cases of hypoglycemia with islet-cell tumor, one is struck by the fact that a large proportion of circumscribed tumors which were removed with relief of symptoms could not be designated as being malignant or benign by the pathologist.

In a previous series, Whipple and Frantz reported 8 tumors in 6 patients. No tumor seemed to have any feature suggestive of malignancy, microscopically, other than the lack of complete encapsulation. Since then, however, in their subsequent series, the histological findings in some cases were definitely suggestive of malignancy. Some of these were listed by Whipple in 1938, but without pathological reports.

This article presents these cases with greater detail and analyzes the cases reported in the literature to date (December 31, 1939), as far as it has been possible to find them. Particular reference is made to possible malignant characteristics.

CHARLES BARON, M D

MISCELLANEOUS

Ogilvie, W H. The Late Complications of Abdominal War Wounds. *Lancet*, 1940, 239 253

The late complications that are likely to be met in war wounds of the abdomen are "burst abdomens" and, still later, ventral hernias, residual abscesses, retained foreign bodies, fecal fistulas, and intestinal obstruction. Three differences are present in these wounds which are not commonly present in planned abdominal wounds of ordinary surgery. First, in war wounds, the abdominal parietes are damaged as well as incised. There may be a great deal of damage to the parietes as well as to the contents of the abdomen. Second, the amount of adhesions present is apt to be greatly in excess of any seen in civilian practice. Third, the first operation will probably have been done by some other surgeon in some other hospital than that in which the permanent care is to be attempted. Thus, any type and arrangement of suture may be present.

In the surgery of war wounds, as in the surgery of infection, the best times to operate are very early (under six hours), or very late (after six weeks).

Because of the loss of tissue in many abdominal wounds, they may have to be closed under great tension, and so it is well to relieve tension in every possible way at the time of the first closure. First, a series of tension sutures about $\frac{3}{4}$ in apart, with a bite of 1 in. of healthy tissue, is placed. The abdominal wound is then closed with at least two layers of sutures, the deeper taking the peritoneum and the posterior rectus sheath or transversalis muscle, and the superficial one taking the anterior layer of the rectus, or the external oblique muscle. These sutures should be of stout catgut and they should be interrupted. The author has twice employed a piece of canvas well impregnated in vaseline to close a defect that would otherwise have been impossible. The canvas was cut a little smaller than the wound in the abdomen and sutured to the surrounding wound edges. When the sutures came out later, the viscera were covered with healthy granulations and final closure could be effected. Somewhat the same thing can be done in wounds which have already eviscerated. Then, gauze sponges thoroughly impregnated in vaseline are laid on the peritoneum and the wound edges brought as close together as possible. Such vaseline gauze makes an excellent substitute peritoneum, and the coils of intestine can move under it for weeks until the wound edges and contents are fused in an oval of granulation tissue.

The problems presented by ventral hernias are sometimes very difficult. It is sometimes wiser not to do anything rather than to risk any further damage. If the hernial edges cannot be brought within 2 in. by pressure on the sides of the abdomen when the legs are drawn up, it is probably better to discourage the idea of operation. The dissection in such cases must be extremely careful in order that no further damage be incurred. Usually there can be no more than two layers in the repair. In the closure of

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MARCEL E. LACROIX, M.D.

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Because of the loss of tissue in many abdominal wounds, they may have to be closed under great tension, and so it is well to relieve tension in every possible way at the time of the first closure. First, a series of tension sutures about $\frac{3}{4}$ in. apart, with a bite of 1 in. of healthy tissue, is placed. The abdominal wound is then closed with at least two layers of sutures, the deeper taking the peritoneum and the posterior rectus sheath or transversalis muscle, and the superficial one taking the anterior layer of the rectus, or the external oblique muscle. These sutures should be of stout catgut and they should be interrupted. The author has twice employed a piece of canvas well impregnated in vaseline to close a defect that would otherwise have been impossible. The canvas was cut a little smaller than the wound in the abdomen and sutured to the surrounding wound edges. When the sutures came out later, the viscera were covered with healthy granulations and final closure could be effected. Somewhat the same thing can be done in wounds which have already eviscerated. Then, gauze sponges thoroughly impregnated in vaseline are laid on the peritoneum and the wound edges brought as close together as possible. Such vaseline gauze makes an excellent substitute peritoneum, and the coils of intestine can move under it for weeks until the wound edges and contents are fused in an oval of granulation tissue.

The problems presented by ventral hernias are sometimes very difficult. It is sometimes wiser not to do anything rather than to risk any further damage. If the hernial edges cannot be brought within 2 in. by pressure on the sides of the abdomen when the legs are drawn up, it is probably better to discourage the idea of operation. The dissection in such cases must be extremely careful in order that no further damage be incurred. Usually there can be no more than two layers in the repair. In the closure of

such hernias, the use of fascial sutures appears to have a definite place.

Residual abscesses are much commoner in war wounds than in civilian surgery. Here again, it is very wise to treat these cases with watchful expectancy. It is well to wait as long as practicable, for these abscesses have a way of burrowing to the surface or into hollow organ. Only at the upper and lower ends of the abdomen, in the subdiaphragmatic space and in the pelvis, does the surgeon often have to open an abscess. One should delay as long as possible while keeping an anxious eye on the clinical course of the patient. Here again the use of vaseline gauze is superior as a drain to anything that we have known before. It drains the entire depth of the abscess. It conforms to the contours of the cavity and it will never perforate an organ or cause hemorrhage from perforation of a blood vessel.

In the treatment of foreign bodies of the abdomen, the rule of very early or very late removal is full effect. All large foreign bodies will have been removed at the first operation or the patient will almost surely have died. The ones remaining will usually be small and they may be lodged in a solid organ, or they migrate to the surface. At any rate, it is wise again to delay operation until the latest possible date. It is not absolutely necessary to remove a foreign body unless it is lying in close proximity to a large vessel, or is responsible for persistent urinary or fecal fistula that cannot be stopped until it is removed. A transperitoneal approach should not be used if it is possible to avoid it, and the foreign body should be localized through the use of all the means available to that end.

Fecal fistulas are usually not under the care of the surgeon who performed the original operation and usually not much in the way of operative notes will be available. Again the keynote of treatment is patience. A fecal fistula is not doing any harm unless it is leading to loss of nourishment and dehydration, and these do not become serious problems unless the fistula is above the lower third of the ileum and not always then. When the patient is losing ground, however waiting can do no good. The fistula may close spontaneously as is its usual tendency. If it does not do so, the longer the period of waiting, the more apt is the tract to become fibrous and better defined. Again, every facility will

be employed to give a clear idea of the condition present. Closure may be effected through local repair or by means of reconstruction. If reconstruction is the procedure of choice, then the area is carefully dissected, the portion of intestine containing the fistula is resected, and the bowel is closed by end-to-end suture. It is much better to resect a little excess intestine in order to be certain that the anastomosis will be in healthy intestine. In the case of anastomosis of the colon, it is usually wise to provide a proximal safety valve.

Intestinal obstruction is always a difficult condition to deal with. In war wounds it is doubly so, for there have been many opportunities for the soiling and denudation of peritoneum. Moreover laparotomy cannot be carried out with the same readiness as in civilian practice. An attempt must be made to distinguish between remediable obstruction that will clear up with measures designed to empty and rest the bowel, and conditions which require surgery. In the doubtful case one can watch the pulse at hourly intervals, and the abdomen at two-hourly intervals watching for changes in distention and peristaltic sounds and for local tenderness and guarding. Our chief aim is to rest the bowel, but there are two others of secondary importance and doubtful attainment—to arrest peristalsis, and neutralize acids.

Rest of the bowel can be accomplished by giving nothing by mouth. Emptying should be carried out above and below. The stomach is best emptied through the use of continuous suction through a Ryle tube. In desperate cases, the Miller Abbott tube is of great value. Enemas containing 6 oz. of equal parts of water and oil produce tremendous peristaltic action and should be repeated at two-hour intervals. Fluids must be kept up through the use of an intravenous drip. A total of 6 pt. of fluids a day should be sought after. This should not contain more than 1 pt. of normal saline solution, and the remainder should consist of 5 per cent glucose in distilled water. In the matter of drugs, morphia is believed to be of value as it increases the uterine, but pituitrin acting directly on the muscle seems less open to objection. The author occasionally employs bacillus *colitidis* in the intravenous fluids in an attempt to minimize the action of toxins.

JOHN W. ERROR, M.D.

GYNECOLOGY

UTERUS

Skinner, I C, and McDonald, J R. Mixed Adenocarcinoma and Squamous-Cell Carcinoma of the Uterus. *Am J Obst & Gynec*, 1940, 40 258

Malignant neoplasms are occasionally found in which there is differentiation into a type of cell entirely foreign to the organ in which it is primary

Mixed adenocarcinoma and squamous cell carcinoma of the uterus is a relatively rare tumor. Only 28 proved cases have been seen at the Mayo Clinic in twenty-five years. Eleven of the carcinomas occurred in the body of the uterus, and 17 in the cervix. They constituted approximately 1 per cent of the total number of uterine carcinomas seen during this period.

The greatest number of cases fall in the same age groups as do the ordinary cellular types of carcinoma of the uterus, 70.6 per cent of mixed-cell carcinomas of the cervix and 72.8 per cent of mixed carcinomas of the uterine body occur between the ages of forty and sixty years. The mixed-cell tumors in the uterine body occurred in a slightly older group of patients than did those in the cervix. The symptoms and signs do not differ appreciably from those of the more common varieties of carcinoma found in the uterine fundus and cervix. Eighty-three per cent of the mixed adenocarcinoma and squamous-cell carcinomas of the cervix were graded 3 and 4 according to Broders' classification, whereas 82 per cent of the carcinomas of the uterine body were graded 1 and 2.

In the cervical carcinomas, the adenomatous and squamous elements predominated in approximately an equal number of cases, the squamous elements being in the majority in 9 tumors, and the glandular elements in 8 tumors. On the other hand, in the entire 11 cases of carcinoma of the body of the uterus, the adenomatous elements were predominant.

It is impossible to make a positive assertion concerning the origin of the mixed squamous cell carcinoma and adenocarcinoma of the uterus. It would appear that the malignant squamous cells in mixed cell carcinomas of the uterus originate from glandular epithelium without the formation of benign squamous epithelium.

Leissner, H. Myoma and Carcinoma of the Corpus (Myom und Korp Sarkinom). *Acta obst et gynec Scand*, 1940, 20 106

The relative frequency of the simultaneous occurrence of myoma and carcinoma of the corpus uteri has been recognized for many years. The etiological relationship between these two conditions, however, is still a mooted issue. Since the end of the nineteenth century, numerous statistical studies by Winther, Hallauer, Frankl, von Frangue, Gutman, and Robert Meyer, have dealt with this subject. From these studies it appears that 20 per cent of

carcinomas of the corpus uteri are associated with myoma whereas only 4 per cent of cervical carcinomas present this association, this is a frequency ratio, therefore, of 5:1.

Recent comprehensive statistical studies of myoma uteri have shown that in 18 per cent there was an associated carcinoma of the corpus, and in 28 per cent there was an associated carcinoma of the cervix (von Frangue, Schottlaender, Olshausen, and Robert Meyer).

After thoroughly reviewing the statistics in the international literature, the author concludes that carcinoma of the corpus is found at least 5 times as frequently in myomatous uteri as it is in uteri free from myoma.

In an attempt to explain the simultaneous occurrence of these two types of tumors, various etiological possibilities must be considered. Some have assumed that the preexisting myoma may act as an irritating factor in stimulating degenerative and carcinomatous changes in the mucosa. Others believe that the simultaneous existence of these two types of tumors is merely an expression of the rather unusual tendency of certain uteri to develop tumors.

The author subjected the material presenting itself in the radium department of the University of Stockholm to careful macroscopic and microscopic studies. These studies have shown that carcinoma occurring in myomatous uteri tends to develop in the most inaccessible portions of the organ. The carcinoma never invades the capsule of the myoma nodules, but rather tends to grow around the latter. Because of the inaccessibility of the malignant growth, one may easily fail to detect its presence by means of uterine curettage.

The material studied by the author is too small to admit conclusive solution of the etiological relationship of the two types of tumors discussed. Nevertheless, it may be of value in diagnosis to call attention to the frequency of simultaneous occurrence of carcinoma and myoma, and to point out the unreliability of diagnostic curettage.

HARRY A. SALZMANN, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Numers, C. von. Luteinized Granulosa-Cell Tumor. *Acta obst et gynec Scand*, 1940, 20 146

Lecène, in 1932, described 2 cases of granulosa-cell tumor under the name of "folliculome lipidique." In these, the tumor cells had become luteinized to a very high degree. The tumor parenchyma showed in these cases an obvious morphological correspondence with corpus-luteum tissue. Only a few cases of such tumors have so far been published, whereas even before Lecène several writers described granulosa-cell tumors in which small areas

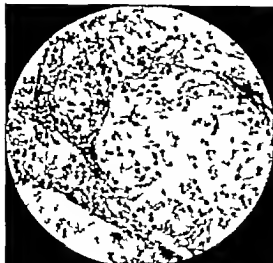


Fig.

of tumor cells having low content of fat were observed.

The author briefly describes case of folliculoma lipidique observed in the Women Clinic in Helsingfors. The patient, a girl of fifteen, who had not yet begun to menstruate presented neither virilism nor other signs of hormonal disturbances. A tumor the size of child's head, originating from the right ovary was removed. Microscopical examination showed that it was mainly composed of large cells resembling corpus-luteum cells, rich in protoplasm, and with a high content of fat (Fig. 1). Isolated

smaller areas were found in which no luteolization had taken place. In these areas the histological picture typical of ordinary granulosa-cell tumors could be observed (Fig. 2).

Ovarian tumors earlier described under the name of luteoma or luteinoma were, in all probability, luteinized granulosa-cell tumors. In some cases no hormonal disturbances were observed in relation to these tumors. In other cases virilism, or some disturbance indicating the prolonged influence of corpus-luteum hormone was observed. The tumors classified as primary ovarian hyperandrogenism are at least histologically difficult to distinguish from luteinized granulosa-cell tumors.

Daniel, C. Malignant Vascular Tumors of the Tubes and the Ovary (Tumeurs vasculaires malignes de la trompe et de l'ovaire) *Gynec. et obs.* 1940, 3 93

Daniel reports case of endothelioma of the right fallopian tube and case of hemangio-endothelioma of the left ovary. He notes that tumors of this type are very rare in both the tubes and the ovaries. In the first case the symptoms suggest ruptured tubal pregnancy with the formation of pelvic hematocoele at operation a small amount of blood

was found in the abdominal cavity and a mass of blood clots in the cul-de-sac of Douglas the tubes and left adnexa were normal. The right ovary appeared normal but was different from the tube which was enlarged in tumor mass at the pavilion. The right adnexa were removed. The patient made good recovery and was free from symptoms year after operation. Histological examination showed an endothelioma. In the second case, the chief symptoms were pain in the lower abdomen and palpable mass. At operation large hemorrhagic cyst was found on the left side, this cyst was intraligamentary and the tube as adherent to its convex side. The right tube was thickened and tortuous and the right ovary was cystic. A subtotal hysterectomy was done with removal of both adnexa. Histological examination of the hemorrhagic cyst showed it to be hemangio-endothelioma. The patient made good recovery and 3 deep ray treatments were given. Eighteen months later she was found to be entirely free from symptoms.

Such vascular tumors of the tubes and ovaries do not produce any typical symptoms they may simulate chronic inflammation of the adnexa, extrauterine pregnancy or intraligamentary hemorrhagic cyst. If there is an acute hemorrhage from the tumor the symptoms are those of ruptured extrauterine pregnancy. The treatment is surgical. There is some difference of opinion as to whether endotheliomas of the tube and ovary are benign or malignant tumors. The author considers that it is best to classify them as being of a low-grade of malignancy to give postoperative radiation, and to keep the patient under observation for prolonged periods.

ALICE M. MYERS.

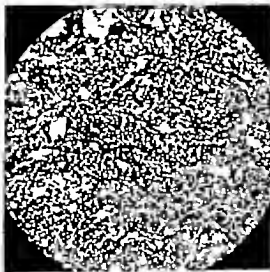


Fig. 2.

GYNECOLOGY

Baron, H A Primary Carcinoma of the Fallopian Tube *Canadian M Ass J*, 1940, 43 118

Baron reports, from the Jewish General Hospital in Montreal, a case of primary carcinoma of the fallopian tube and reviews the 362 cases of this unusual condition found in the medical literature. Kahn and Norris believed primary tubal carcinoma to be one hundred times as rare as carcinoma of the uterus.

The tumor occurs typically in the outer two thirds of the tube, is usually club shaped in appearance, and suggests a chronic pelvic infection with unilateral or bilateral pus tubes. Serosal involvement is late, the growth rarely penetrating the tubal wall. Microscopically, three forms of growth, all mucosal in origin, are described: the malignant papilloma, the adenoma, and the alveolar carcinoma. The papillary type is most common. Spread is by way of the lymphatics and usually to remote areas. Pain is encountered early and is due to tubal colic. Diagnosis is difficult but is suggested by the occurrence of pain in the lower abdomen associated with a thin, watery or sanguineous vaginal discharge and enlarged, irregular adnexal masses, uterine changes are absent.

Treatment is by radical operation followed by deep x-ray therapy. Prognosis is very poor, only 7 patients having survived three years without recurrence. Baron's patient with "moderately differentiated adenocarcinoma, probably arising in the Fallopian tube" survived about three months following surgery and x-ray treatment.

WILLARD G FRENCH, M D

MISCELLANEOUS

Petersen, E The Results of Surgical Interventions on the Sympathetic Nervous System in Benign Gynecological Diseases (Ueber die Resultate bei Eingriffen in das sympathische Nervensystem bei benignen gynäkologischen Leiden) *Acta obst et gynec Scand*, 1940, 20 1

The value of surgical intervention in the sympathetic nervous system as a means of treating benign gynecological diseases is variously estimated. Frequently the results were tabulated too early after the operations. French surgeons are more optimistic about cures than surgeons of other countries. To properly estimate the final outcome of these operations, the number of neurotic patients must be considered. Many neurotics claim immediate benefits, only to return later with the same, or new complaints.

The author reports his own cases treated from 1927 to 1937, and modestly adds the hope that this contribution will aid in judging the permanency of this therapy. He reported on 67 patients. The follow-up periods were from one to eleven years, and averaged from five to six years. Patients who did not return, or could not be traced, were not included in his report. Surgery was never resorted to unless the usual treatment was ineffectual.

There were 53 patients with small ovarian cysts, in all of whom the presacral nerve was resected. Of the remaining patients 7 had dysmenorrhea, 3 vaginismus, 5 chronic parametritis, and 1 pruritus ani. The last was a man and therefore this case does not really belong here. However, since pruritus ani et vulvæ are commonly considered indications for resection of the presacral nerve, the author included this case in his series. It is remarkable that there were no abnormalities of the internal genitalia in any excepting the cases of parametritis. These were "simple cases since neither the uterus, tubes, nor ovaries showed any pathologic changes." In all these cases resection was the only therapy used.

The results were as follows: Among 7 cases of dysmenorrhea there were 4 with good results, in 1 patient the condition was improved, and in 2 there was no appreciable cessation of pains.

In 1 case of vaginismus the results were good, this patient was cured of dyspareunia, which for years had made coitus impossible. In 2 additional cases of small ovarian cysts complaints of dyspareunia were made, but this was not relieved after nerve resection.

In 1 case of pruritus ani the itching stopped completely, after having existed for years despite all kinds of treatment. After one month the itch returned and after three months it was as bad as ever. There were 5 cases of parametritis. Following the operation 1 patient was free from pains for seven years, and 1 patient had definite improvement which lasted to date for seven and five years, respectively, 1 case was unaltered.

Of these 4 groups of patients more than 50 per cent were freed from pains. In 4 cases, including that of pruritus ani, results were negative.

In 30 of the 53 cases of cystic degeneration of the ovaries, the Cotte operation was done, and in 23, the Dupont-L'Hermite denervation of the ovaries was resorted to. In addition to nerve operations, punctures or resections of small ovarian cysts were done in all of these patients.

The value of these combined operations must be judged as rather insignificant, yet the results lasted longer than in the 42 control patients who were not subjected to operations of the nerves, of these 42, none experienced any lasting freedom from pains.

The 30 Cotte operations yielded 9, and the 23 Dupont L'Hermite, 6 results which were entirely painless. The observations were made up to eleven years after operation.

In the discussion Bjoerckenheim cited his 14 cases of severe dysmenorrhea. These patients had been treated unsuccessfully by cervical dilatation, curettage, narcotics, or tamponade. In addition to the Cotte operation, Bjoerckenheim followed the Cotte practice of always doing an "antesuspensio uteri," as well as appendectomies and ovarian punctures whenever indicated. Eleven patients experienced complete cessation of pains, on 1 patient, no information could be obtained, 2 experienced no improvement.

ment (1 of these was a psychoneurotic who exaggerated her pains to a marked degree). Two married women later became pregnant and labor proceeded normally.

SKAJAA performed the Cotte operation many times. His table includes 66 patients who were operated upon without having any other treatment for pains or for reflex distress emanating from the genital canal. He describes severe essential dysmenorrhea as lasting up to fourteen days and recurring in from one to two weeks. In addition to the premenstrual pains, premenstrual dyspareunia may also be present. Nearly regularly there were distinctly marked reflex symptoms such as nausea, vertigo, headache, depression, migraine, and epileptiform cramps. Some patients are afflicted with constant pains with exacerbations, occurring in different parts of the abdomen—steady pelvic pressure, lancinating pain in the iliac fossa, backaches, a sensation of anal pressure and rectal tenesmus, gaseous distention of the abdomen, these symptoms often simulating an acute abdomen. In a great number of patients psychic trauma or fear brings on attacks.

A constant uterine hypersensitivity is present in these patients, either in the entire organ, the posterior part of the cervix, the sacro-uterine ligaments, or the posterior part of the cul-de-sac of Douglas. The plexus hypogastricus inferior is, according to these localizations, also hypersensitive. Pressing against the promontorium also elicits increased sensitivity of the plexus hypogastricus superior.

Pin punctures and pinching of the skin of parts of the pelvis and lower extremities show hyperalgesic zones in these cases. This syndrome is not known to Skajaa before being described by Cotte as "grande neuralgie pelvienne." Skajaa believes that this is one of the most frequent forms of pelvic diseases in women. Cotte prefers the term "plexalgia hypogastrica" as including all conditions that are indications for his operation.

In conclusion, the result of these operations may take from two months to one-half year to be satisfactory or negative. The close relationship between hyperalgesia and pains is not only of diagnostic and of prognostic importance but also points to the nature of the malady. M. M. J. SEEVER, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Küster, K. H. A Roentgenological Study of a Case of Spontaneous Version (Ein Fall von Versio spontanea, verfolgt durch Roentgenuntersuchung) *Acta obst et gynec Scand*, 1940, 20: 59

The location of pelvic tumors may be such as to cause an absolute hindrance to labor and constitute a positive indication for delivery by cesarean section. Pelvic tumors may also cause deflections or transverse positions. To establish the presence of a suspected abnormal position of the fetus or of a pelvic tumor, a ray examination is preferable to the usual bimanual examination. Simple A P plates definitely show important findings without inflicting any deleterious effects upon mother or child.

The author reports the clinical history of a case which demonstrates the value of simple ventrodorsal plates taken during the course of a unique lying in period. The patient had had two previous normal gestations and gave birth to large babies in cephalic positions. A third gestation period was normal except for a knotty growth in the right iliac fossa, hugging the iliac crest. The patient was never disturbed by this tumor during the one and one half years of its presence, even though it grew from the size of a walnut to that of a fist during this gestation. Palpation showed this tumor to be hard, fibrous, scarcely movable, not sensitive, and apparently imbedded in the abdominal wall.

In order to establish definitely the diagnosis of a transverse position and to decide whether or not the tumor would influence the position of the fetus a roentgen plate was made after injecting the bladder with 50 c cm of sodium iodide. The child was found to be in a transverse position although the x ray examination did not demonstrate any trace of the tumor. The position of the fetus continued to remain unaltered. After placing it normally the transverse position would be immediately resumed.

As soon as labor pains began x ray pictures were taken immediately. They showed the fetus in longitudinal position, the head downward and the back inclined toward the left. Because of this finding it was possible to await a spontaneous delivery calmly. This was of especially great importance since it was impossible to exclude the possibility of the tumor acting as a hindrance during labor. The child was born in an ordinary vertex presentation.

Spontaneous version occurs so seldom that, in view of the therapeutic possibilities, the presence of a transverse position can hardly be correlated with it. How frequently a version occurs in one woman is a phenomenon usually called only when a change to a vertex presentation takes place and at the late moment he can hardly afford to wait for such a change.

Haussmann defines spontaneous version as follows: "By spontaneous version we understand a course of action by virtue of which a transverse position at the beginning of labor will be changed to a normal position, or vice versa, solely and alone by natural aid, after which change the labor will then proceed along its usual course." These versions may occur in the true or false pelvis, or even in the pelvic outlet. Some authorities, however, insist that the term "spontaneous version" should be limited to those cases in which the change is completed in the true pelvis.

The author completes his article with an exhaustive review of the literature on spontaneous version. MATILAS J. SEIFFERT, M.D.

LABOR AND ITS COMPLICATIONS

Briquet, R. Obstetrical Shock (Do choque obstétrico) *Rev Fac de med de Montevideo*, 1940, 23: 458

Briquet states that obstetrical shock of the hemorrhagic type occurs in low insertion or premature detachment of the placenta and in abortion, that of traumatic type occurs in sudden emptying of the uterus (twin pregnancy, hydramnios, or large fetus), in prolonged labor, and in surgical delivery, that of neurogenic type is much rarer than the other two and occurs in patients in whom emotional factors and certain constitutional conditions predominate. He accepts as best the definition of shock given by Moon who regards it as a circulatory deficiency which, while not of cardiac or vasomotor origin, is characterized by decrease in the blood volume, lower cardiac output, and higher blood concentration. At present, the most satisfactory classification of shock is that of Blalock who considers three groups: hematogenous, which includes the hemorrhagic and traumatic types, neurogenic, and vasogenous.

Hematogenous shock is always secondary and due to hemorrhage or to traumatism. In hemorrhagic shock Blalock observed in his experiments on dogs that the cardiac output is decreased, but the blood pressure is affected only when the cardiac output has fallen to 60 per cent or less of its original value, then the hypotension increases gradually. Hemorrhagic shock should not be confused with traumatic shock in which the hypotension precedes the decrease in cardiac output and is more pronounced than the latter. In hemorrhagic shock, the mean blood pressure in the presence of reduced cardiac output is maintained by the compensatory vasoconstriction. When the blood pressure decreases to the critical point which according to Cannon is 60 to 70 mm, the vasoconstrictor center ceases to function and vasodilatation supervenes leading to death, this explains why a late transfusion may have a

therapeutic effect the vasomotor center has become incapable of responding to the stimulation.

In traumatic shock, Blacklock explains the presence of decrease in the number of red cells by the greater loss of plasma than of red cells with resulting concentration of blood in the injured areas, while in hemorrhagic shock there is a certain effusion of the blood because of the decrease in capillary blood pressure. In traumatic shock, there is decrease in the cardiac output with temporary preservation of the arterial pressure which falls when this condition becomes worse. In the beginning, the state of shock does not depend on toxins liberated by the traumatized tissues, and the influence of other factors, such as stimuli originating in the traumatized zone, must be admitted. Moon points out that in hemogenous shock the blood volume of the capillaries of the somatic parts of the body is not visibly increased, but there is great congestion of the capillaries and venules of the visceral portions which present a variable degree of edema of the tissues and of effusion in the serous cavities, the fluids having an albumen content nearly equal to that of the blood plasma.

In grave shock, the first valuable sign is the blood concentration, which may reach from 6,000,000 to 9,000,000 red cells and is due to blood stasis in the capillary network. This gives rise to a vicious circle: the decreased oxidation favors fall in temperature which predisposes to capillary stasis and increases the viscosity of the blood; transudation of the plasma causes blood concentration and raises the viscosity of the blood, which establishes the vicious circle.

Neurogenous shock is primary and the hypotension is of reflex origin. To this group belong conditions of shock due to abdominal or uterine trauma, disturbances of emotional basis, postural hypotension, syncope of carotid-sinus origin, and accidents of spinal anesthesia. In the beginning the arterial pressure is decreased then the cardiac output, but to a slighter degree.

Vasogenous shock is typically produced by histamine, which acts directly on the vessels favoring hypotension; this is followed by reduction in the activity of the heart. Vasogenous shock does not present much obstetrical interest; ergotone may cause it.

Prompt diagnosis is indispensable in order to institute early and correct treatment. The prophylactic measures include physical rest and the administration of fluids, reduction of the duration of the intervention and of manipulations to the strictest minimum, and the avoidance of carbon dioxide in inhalation anesthesia. The curative treatment of hemogenous shock consists of combating the circulatory deficiency and restoring the blood volume. Cardiac and vasoconstricting drugs are useless and there is no proof of direct action of caffeine or strychnine on capillary tonus. Hot coffee and tea have given good results in a number of severe cases. Lowering the head and compressing the abdomen are condemned. Blood transfusion is the treatment

of choice: if blood is not available, solution of gum araca is used; glucose serum is contraindicated. In neurogenous shock, the treatment consists essentially of placing the patient in the Trendelenburg position and administering epinephrine and other vasoconstricting drugs. RICHARD KRAETZ, M.D.

TAMM, A. B., and KLEIN, M. D. A Critical Analysis of Cesarean Section in Large Municipal Hospital. *Am. J. Obst. & Gynec.*, 1910, 40, 32.

An analysis of cesarean sections at Morrisania City Hospital, New York is presented. The incidence of cesarean section is 0.8 per cent, or 1 in 129 deliveries. The uncorrected cesarean maternal mortality rate is 10.7 per cent. The general uncorrected maternal mortality rate for all deliveries spontaneous and operative is 5.3 per thousand living births.

The indications for cesarean section are separately considered, and the errors in judgment of technique are discussed. The superiority of the low segment operation over the classical section is confirmed. The rôle of peritonitis as a cause of maternal mortality following the operation is stressed. The probable causes for this complication at Morrisania City Hospital are enumerated, and the methods whereby its occurrence may be reduced are described.

Two factors however have played a prominent rôle in the incidence of peritonitis: (1) the introduction of infection at the operating table and (2) the type of operation selected. The incidence of wound infections which, fortunately consisted mostly of mild staphylococci was close to 30 per cent in spite of the most rigorous precautions in preparing the abdomen for operation. Autopsies on 3 of the 7 patients who succumbed from peritonitis clearly indicated an extension of the infection from the abdominal wound to the general peritoneal cavity.

In checking over the possible sources for this break in technique the operating room itself came under suspicion. The hospital has two major operating rooms for the use of all surgical cases. As less than 50 per cent of the cesarean sections are elective, not infrequently the operation followed shortly after a potentially or actually infected surgical case. The nursing personnel remained the same for both operations. It is not difficult, therefore, to imagine cross-infection under such circumstances.

The second factor of importance affecting the incidence of peritonitis is related to the type of cesarean operation selected. The classical cesarean section was performed on 6 patients. Six died of peritonitis; maternal death rate of 8.3 per cent. The low-segment operation was performed 37 times. 14th death from peritonitis; maternal death rate of 7 per cent. The conditions under which the low-segment operation was performed were less favorable than those of the classical group. Nevertheless, notwithstanding this disadvantage, the low segment operation gave three times more security against the occurrence of peritonitis.

EDWARD L. CORNELL, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Kepler E. J., and Rymaszewski, E. H. Diseases of the Adrenal Glands. *Med. Clin. North Am.* 1940, 34: 35.

Acute adrenocortical insufficiency is accompanied by chemical and physical changes in the interstitial fluids, the blood, and, presumably the cells. Some of these changes are constant and probably fundamental, whereas others are secondary and variable. Among the changes are:

Depletion of the body stores of sodium because of increased urinary excretion of sodium. The total base of the extracellular fluid of the body is thereby reduced.

1. Loss of sodium ions in excess of chloride ions.

2. Decreased urinary excretion of potassium and an increase in the potassium content of the blood.

3. Loss of water from the interstitial spaces and later from the blood.

4. Hemoconcentration and reduction in the total volume of blood. The former is manifested by an increase in the concentration of the plasma proteins and the latter by an increase in the percentage of erythrocytes relative to the plasma.

5. Chemical changes in the blood that are usually indicative of renal insufficiency but without histopathological changes in the kidneys. The concentration of the blood non-protein nitrogen, urea, and sulfates increases.

6. Varying degrees of hypoglycemia and disturbances in the mobilization and storage of glycogen.

7. Decreased utilization of oxygen, hypothermia, and lowering of the basal metabolic rate.

In addition to the potent amorphous extracts, crystalline steroids that have varying degrees of potency in the prevention or rectification of acute adrenocortical insufficiency can be isolated from the adrenal cortex. In chemical structure these substances are closely allied to the purified male and female sex hormones, such as androsterone, testosterone, estrone, estrinol, progesterone, as if they can be regarded as cortical hormones or as derivatives of more fundamental cortical hormone.

Acute cortical insufficiency develops either as result of rapidly destructive lesions of the cortex or following sudden stresses thrown on an individual suffering from chronic adrenocortical insufficiency. Chronic adrenal insufficiency or Addison's disease, is the end-result of slowly progressing destructive lesions of the adrenal cortex.

The symptoms of acute adrenal insufficiency are anorexia, vomiting, hiccough, epigastric pain, diarrhea, rapid loss of weight, circulatory collapse, and great prostration, and these occur in rapid sequence. Ultimately delirium, coma, and death ensue. The terminal symptoms may simulate meningitis or other intracranial lesions. The blood pressure is almost

invariably reduced, as is the concentration of the plasma sodium chloride, and total base. Hypoglycemia, increased plasma potassium, and retention of nitrogenous products in the blood may or may not be present.

The symptoms of chronic adrenal insufficiency or Addison's disease, are, on the other hand, notoriously vague and descriptive in their onset and progress. In some cases fatigue is the only symptom. Weakness, anorexia, pigmentation of the skin, and loss of weight are among the common earlier symptoms. Attacks of epigastric distress and vomiting, of faintness or fainting attacks are not unusual. Inordinate fondness for salt is sometimes noted. Hypotension of some degree is often present, but blood pressure readings within normal limits are by no means uncommon. The chemical constituents of the blood may be normal in all respects. When patients are not treated, acute cortical insufficiency with its attendant symptoms ultimately appears.

Acute adrenal insufficiency can usually be recognized in cases of known Addison's disease by (1) the characteristic change in the clinical picture which accompanies such crisis, (2) studies of the blood chemistry and (3) the rapid response to specific therapy. The diagnosis in cases in which patients are not known to have Addison's disease may be exceedingly difficult, especially if the pigmentation is minimal or absent.

Three types of procedures to demonstrate chronic adrenocortical insufficiency (compensated) have been devised.

1. The production of acute adrenal insufficiency by restriction of the intake of sodium chloride.

Estimation of the concentration of sodium and chloride in the urine after the patient has been kept on standard regimen in which the intake of sodium chloride has been restricted to a low value and in which the intake of potassium has been kept high.

2. Observation of the effect on the renal excretion of electrolytes following the administration of potent cortical hormone.

The first procedure is decidedly hazardous and may terminate fatally. It should never be carried out unless the physician is thoroughly familiar with the early signs and symptoms of acute adrenal insufficiency and has facilities for treating it promptly. The test should be terminated immediately if adrenal insufficiency ensues. The second test is less hazardous but it is by no means free of danger and not infrequently has to be terminated the second day because of acute adrenal insufficiency. It likewise should not be used by the inexperienced. The third procedure is accompanied by risk but is not generally applicable because of the necessity of carefully conducted balance studies, metabolic ward and laboratory. The latter extend the same difficulty applies to the second procedure.

Acute adrenal insufficiency usually proves to be fatal unless it is recognized promptly and treated vigorously. It constitutes a medical emergency as grave as diabetic coma. To a large measure, successful treatment depends on early recognition of the condition and on the promptness with which treatment is instituted. Anorexia, hiccough, and vomiting are early danger signals in any patient known to have Addison's disease and nearly always indicate an impending crisis. Infections of any sort usually are significant of serious future difficulties, and for this reason should be regarded with the greatest respect.

At the onset of symptoms most patients will respond quickly to an intravenous injection of 1 liter of a solution containing 9 gm of sodium chloride, 5 gm of sodium citrate, 50 gm of glucose, and from 10 to 20 c cm of a potent cortical extract. Patients who have been in a state of crisis for an appreciable time will require more vigorous treatment than the foregoing. Ten cubic centimeters of the extract should be administered intravenously hourly and a liter of the salt-citrate-glucose solution at intervals of six hours. There seems to be very little, if any, danger of administering too much extract. Desoxycorticosterone acetate as dispensed at the present time should not be used in the treatment of a crisis, because this substance is administered intramuscularly in sesame oil and has a relatively slow action. If the patient is completely unconscious the outlook is very grave, and if recovery does take place, residual permanent or semipermanent injury to the central nervous system may be the aftermath. After recovery begins, oral administration of the salt and citrate solution should be substituted for the intravenous injections. About 1 liter should be taken daily. From 10 to 20 c cm or more of the extract should be given daily and the amount gradually reduced to the maintenance dosage. If edema appears, the intake of the solution of salt and citrate should be reduced.

There is no unanimity of opinion regarding the maintenance treatment of patients having chronic adrenal insufficiency. Some patients can be maintained in fair health merely by drinking daily a liter of a solution containing 10 gm of sodium chloride and 5 gm of sodium citrate, especially if the intake of potassium in the diet is restricted. The cost of treating Addison's disease solely with cortical extract is prohibitive to most patients. The cost of treatment can be kept within reasonable limits by the combined use of cortical extract and the ingestion of extra salt plus sodium citrate. Oral administration of adrenal cortical extract should not be relied on.

Synthetically prepared desoxycorticosterone acetate recently has been made available for general clinical use. Opinions are divided regarding the merits of the compound.

Finally, regardless of the type of therapy decided on, certain adjuncts to the specific treatment are important.

1 The diet should be high in calories and liberal in vitamins. Food should be taken at regular intervals.

2 The potassium content of the diet should be kept relatively constant at a fairly low value, unless desoxycorticosterone acetate is being used.

3 In so far as possible "stresses" of all sorts should be avoided.

4 An effort should be made to avoid the occurrence of infections, and if they occur, intensive treatment with cortical extract should be instituted.

5 Any coexisting tuberculous lesion should be treated.

Hyperfunctioning lesions of the adrenal cortex, such as benign or malignant adenoma, carcinoma, or diffuse bilateral cortical hyperplasia, are capable of producing clinical syndromes characterized by profound changes in the sexual organs and characteristics, and variable, less specific constitutional symptoms. Young adult women are the chief victims. The disease, however, occurs in girls and, occasionally, in boys and men.

Certain variable symptoms occur which are to some extent common to all cases of hyperfunctioning cortical adrenal tumors. These include hypertension, acne, florid complexion, purplish striations of the skin, obesity affecting the face and trunk but sparing the extremities, osteoporosis, latent or frank diabetes, and occasionally, alkalosis with reduced plasma chlorides and potassium. In addition, there may be late symptoms referable to an expanding lesion in one of the upper quadrants of the abdomen.

Cortico-adrenal tumors in boys generally, but not always, result in precocious puberty of the homologous type, that is, puberty is premature but is essentially normal in other respects. In girls these lesions produce precocious puberty of the heterologous type, that is, puberty not only is premature but is more masculine than feminine. The clitoris enlarges, the hair of the body is distributed in masculine fashion, the voice becomes coarse, but the breasts may enlarge and premature menstruation may occur. In children of either sex, dentition may be premature, and the psychic status may correspond to the degree of sexual precocity present.

Cortical tumors in adult males have been known to cause gynecomastia, feminine habitus, disappearance of the beard, loss of libido, and a decrease in the size of the penis and testes.

In most cases cortico-adrenal tumors occur in young women. Amenorrhea and varying degrees of virilism, such as enlargement of the clitoris, atrophy of the breasts, masculine distribution of the hair, and coarse voice, are the chief characteristics.

Unfortunately, the syndromes associated with adrenocortical tumors are by no means pathognomonic. Similar and sometimes identical clinical features occur in connection with the following conditions: (1) basophilic tumors of the pituitary gland, (2) various intracranial diseases not directly involving the pituitary body, such as pinealomas, internal hydrocephalus, and inflammatory lesions, (3) hyperfunctioning gonadal tumors, such as arrhenoblas-

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2. Estimation of the concentration of sodium and chloride in the urine after the patient has been kept on a standard regimen in which the intake of sodium chloride has been restricted to a low value and in which the intake of potassium has been kept high.

3. Observation of the effect on the renal excretion of electrolytes following the administration of potent cortical hormone.

The first procedure is decidedly hazardous and may terminate fatally. It should never be carried out unless the physician is thoroughly familiar with the early signs and symptoms of early acute adrenal insufficiency and has facilities for treating it promptly. The test should be terminated immediately if adrenal insufficiency ensues. The second test is less hazardous but it is by no means free of danger and not infrequently has to be terminated on the second day because of acute adrenal insufficiency. It likewise should not be used by the inexperienced. The third procedure is accompanied by no risk but is of generally applicable because of the necessity of carefully conducted balance studies in metabolic ward and laboratory. It does not extend the same difficulty applies to the second procedure.

cause of the growth-stimulating action on the structure with which the surgeon has to work.

In cases of true eunuchism, vigorous replacement therapy with testosterone propionate is unquestionably worth a thorough trial as in a number of instances good results have been obtained. Unfortunately replacement therapy for this condition is exceedingly expensive. Likewise in cases of true male hypogonitabism, endocrine therapy is indicated if there are reasonable indications that spontaneous development is not likely to occur. One of the major problems is the differentiation of hypogonitabism secondary to insufficiency of the anterior lobe of the pituitary gland from primary hypogonadism. In the former, stimulation therapy is indicated and in the latter replacement therapy is the treatment of choice. In many instances this differentiation unfortunately cannot be made. Both types of therapy have been employed with a certain amount of success. Either type of therapy is likely to fail in cases of long standing.

The indications for the use of either testosterone propionate or gonadotropic substances in the treatment of any condition that is characterized by impotence are few. Unlike the ovaries, testes can be inspected and palpated easily. If on examination they seem to be normal and if there are no other objective signs of testicular insufficiency, such as feminine appearance, lack of beard, and the other well known stigmata, it is safe to assume that their hormonal function is probably not impaired, and that neither stimulating nor replacement therapy is likely to be of any value.

Perhaps in the future men suffering from obstruction at the vesical neck may be relieved by some form of endocrine therapy. At present, the great majority will have to submit to operation.

MISCELLANEOUS

MacNeill, A. E., and Bowler, J. P. Irrigation and Tidal Drainage. *New England J Med*, 1940, 223: 128.

This paper describes modifications of a previously described tidal drainage apparatus, resulting in an instrument of wide urological application.

The apparatus described accomplishes first, intermittent bladder drainage and filling, or tidal drainage, second, tidal drainage, with succeeding irrigation, and third, automatic internal bladder irrigation.

JOHN A. LOIR, M.D.

Mahoney, J. F., Wolcott, R. R., and Van Slyke, C. J. Sulfamethylthiazole and Sulfathiazole Therapy of Gonococcal Infections. *Am J Syph, Gonorr & Ven Dis*, 1940, 24: 613.

In an attempt to determine the efficacy of sulfamethylthiazole and sulfathiazole in the treatment of gonococcal infections, the authors obtained a 92.1 per cent cure rate in patients who had not received previous chemotherapy and a 53.8 per cent cure rate in patients who had failed to obtain cure from the previous administration of sulfanilamide. Because of the high incidence of findings which might be construed as evidence of mild attacks of toxic peripheral neuritis, the use of sulfamethylthiazole in the treatment of gonococcal infections is not recommended.

A preliminary report on the use of sulfathiazole with a cure rate of 91.1 per cent in both treated and untreated cases of gonococcal infections, and absence of evidence of toxicity led the authors to infer that sulfathiazole constitutes an effective addition to the treatment of gonorrhea.

D. E. MURRAY, M.D.

omas and interstitial-cell tumors of the testis and (4) other diseases already mentioned associated with cortical hyperplasia. In addition, there is a large group of women with varying degrees of hirsutism, menstrual disturbances, and obesity who have no organic lesions of the adrenal glands. These women appear normal in all other respects.

In spite of the various difficulties involved, it is important that conscientious effort be made to establish a diagnosis, since not only do the symptoms of adrenal cortical tumor promptly regress after the tumor has been removed, but death from metastases usually is the result if extirpation of the tumor is not undertaken. The following factors aid in diagnosis: (1) intravenous urography occasionally shows evidence of a large adrenal tumor; (2) smaller adrenal tumors sometimes can be visualized roentgenographically after air has been injected into the perirenal tissue spaces; (3) in some instances of adrenocortical carcinoma large amounts of estrogenic substances can be found in the urine (the results of the usual urinary tests based on the content of gonadotropic hormone of pregnancy will be negative); (4) the urine can be assayed for excess content of androgenic substances; and (5) in some doubtful instances it may be necessary to visualize the adrenal glands by surgical exploration in order to confirm or deny the presence of an adrenal tumor.

The treatment of adrenocortical tumors is surgical. After removal of such tumors, failure of the remaining gland (which is often atrophic) can be expected and should be anticipated. Consequently for one or two days before, and for from seven to ten days after operation, such patients should be treated as if they had Addison disease. This treatment should be continued after the need for it is no longer apparent and then it should be gradually discontinued. If at operation no tumor is found and if the adrenal glands are definitely hyperplastic, unilateral adrenalectomy or partial bilateral resection may be considered. Experience with such surgical procedures has not been sufficiently great to justify an unqualified recommendation of them at present.

Diseases of the adrenal medulla occur less frequently than those of the cortex. Hypermedullary adrenalinism resulting from hyperfunctioning medullary tumors or allied tumors of the chromaffin tissue has been established as a definite clinical entity.

The chief symptoms are vasomotor attacks, tachycardia, and paroxysmal hypertension, nausea, vomiting, and tremor. Glycosuria and elevation of the basal metabolic rate may be present. In rare instances, hypertension may be continuous. Contrary to what might be expected, sweating may occur during the crises. Sudden death, especially from minor surgical procedures, is not uncommon.

The diagnosis is often difficult, especially if the patient is not under observation during an attack or if the hypertension is relatively continuous rather than paroxysmal. The repeated occurrence of paroxysms of hypertension justifies a tentative diagnosis of this condition.

Treatment is surgical and, if the tumor can be removed, it results in cure.

Ash, Upmark, R. On Amyloidosis Induced by Tumors of the Kidney. *J. Clin. Med. Sci.* 1932, 34: 5.

The clinical pathology of amyloidosis is briefly reviewed. Two main categories may be distinguished: primary amyloidosis and secondary amyloidosis. The amyloidosis in connection with multiple myeloma, in certain respects, represents a transitional type.

Two cases of secondary amyloidosis induced by Cawitz tumors of the kidney are described. Earlier observations along this line are recalled and survey is given of the material available.

From the pathogenic point of view it seems reasonable to connect the evolution of amyloidosis induced by renal tumors with the long-continued course of these growths, and the likelihood of their interference with the biological response mechanism of the body as evidenced by the high sedimentation rate and the frequent occurrence of pyrexia.

The diagnostic importance is stressed. When confronted with amyloidosis of apparently obscure origin, the possibility of underlying renal neoplasia should always be considered. If, on the other hand, a tumor of the kidney has been diagnosed, the contemporary occurrence of such a symptom as hepatomegaly does not necessarily indicate the existence of metastatic deposits, since amyloidosis may be present.

With regard to therapy it should be observed that amyloidosis may be induced by renal tumors even if no metastatic deposits have as yet been established, and that the process of amyloidosis is reversible if the condition responsible is removed.

A brief survey is given of the nephrotic syndromes and their relation to surgery.

GENITAL ORGANS

Pool, T. L., Cook, E. N. and Kessler, E. J. Endocrine Therapy of Cryptorchidism, Impotence, and Prostatic Obstruction. *Med. Clin. North Am.*, 1934, 24: 257.

The non-surgical treatment of cryptorchidism is recent innovation and almost wholly endocrine in character. The chief substances that have been used are (1) the anterior pituitary-like principle (A.P.L.) which occurs in the urine during pregnancy; (2) extracts of the anterior lobe of the pituitary body itself; (3) pregnant mare's serum; and (4) testosterone propionate.

The indications for the use of anterior pituitary-like substance in cases of cryptorchidism have not been established definitely to everyone's satisfaction and the results of this form of therapy are decidedly uncertain.

The use of almost any of these substances may be of considerable value in the pre-operative and post-operative surgical treatment of this condition, be-

MISCELLANEOUS

MacNeill, A. I., and Bowler, J. P. Irrigation and Tidal Drainage. *New England J. Med.*, 1940, 223, 15.

This paper describes modifications of a previously described tidal drainage apparatus, resulting in an instrument of wide urological application.

The apparatus described accomplishes first, intermittent bladder drainage and filling, or tidal drainage, second, tidal drainage with succeeding irrigation, and third, automatic internal bladder irrigation.

Jones, A. L., M.D.
Mahoney, J. J., Wolcott, R. R., and Van Slyke, C. J. Sulfamethylthiazole and Sulfathiazole Therapy of Gonococcal Infections. *Br. J. Syph.*, 1941, 17, 10, 214-215.

In an attempt to determine the efficacy of sulfamethylthiazole and sulfathiazole in the treatment of gonococcal infections, the author obtained 70.1 per cent cure rate in patients who had not received previous chemotherapy and 53.8 per cent cure rate in patients who had failed to obtain cure from the previous administration of sulfamylamide. Because of the high incidence of findings which might be construed as evidence of mild attacks of toxic peripheral neuritis the use of sulfamethylthiazole in the treatment of gonococcal infections is not recommended.

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D. J. McLELLAN, M.D.

cause of the growth stimulating action on the structure with which the surgeon has to work.

In cases of true eunuchism, vigorous replacement therapy with testosterone propionate is unquestionably worth a thorough trial as in a number of instances good results have been obtained. Unfortunately replacement therapy for this condition is exceedingly expensive. Likewise in case of true male hypogonadism in endocrine therapy is indicated if there are reasonable and rational that spontaneous development is not likely to occur. One of the major problems is the differentiation of hypogonadism secondary to insufficiency of the anterior lobe of the pituitary gland from primary hypogonadism. In the former stimulation therapy is indicated and in the latter replacement therapy is the treatment of choice. In many instances this differentiation unfortunately cannot be made. Both types of therapy have been employed with a certain amount of success. Either type of therapy is likely to fail in case of long standing.

The indication for the use of either testosterone propionate or gonadotropic substance in the treatment of any condition that is characterized by impotence are few. Unlike the ovaries, testis can be inspected and palpated easily. If on examination they seem to be normal and if there are no other objective signs of testicular atrophy, such as feminine appearance, lack of beard, and the other well known stigmata, it is safe to assume that their hormonal function is probably not impaired and that neither stimulating nor replacement therapy is likely to be of any value.

Perhaps in the future men suffering from obstructive at the vesical neck may be relieved by some form of endocrine therapy. At present, the great majority will have to submit to operation.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Jaffe, H. L., and Lichtenstein, L. Osteoid-Osteoma: Further Experience with This Benign Tumor of Bone, with Special Reference to Cases Showing the Lesion in Relation to Shaft Cortices and Commonly Misclassified as Instances of Sclerosing Non-Suppurative Osteomyelitis or Cortical Bone Abscess. *J Bone & Joint Surg* 940, 645

Under the heading of osteoid-osteoma, Jaffe in 935 called attention to benign bone tumor which had apparently not been described previously and presented a series of 6 cases. The present communication is based on further experience with this lesion, the authors having now observed 33 cases.

Osteoid-osteoma is a small, slowly growing neoplasm which may develop in spongy or cortical bone. It starts as a proliferation of the local bone-forming mesenchyme and particularly of its osteoblasts. As the lesion develops, considerable amount of osteoid tissue is deposited between the osteoblasts. Later the osteoid tissue becomes slowly calcified, being converted into typical hypercalcified bone.

Immediately surrounding the tumor and apparently in response to the irritation caused by the slow torpid growth of the lesion, an area of perilesional sclerosis is formed which may be small in size if the tumor begins in spongy bone, but which may be particularly striking if the neoplasm involves a shaft cortex. There is no evidence of an inflammatory process at any stage of the evolution of this tumor.

The disorder appears to have a predilection for adolescents and young adults chiefly between the ages of ten and twenty-five years. It has been observed in all parts of the skeleton except the ribs, pelvis, and skull. Trauma is apparently not an important etiological factor. The presenting symptom is localized pain, usually of several months duration, which may be persistent and severe enough to wake the patient at night. There is usually some local tenderness and swelling. Signs of inflammation such as chills, fever and local warmth are completely absent.

The roentgenographic picture affords the chief diagnostic evidence, but is very likely to be misinterpreted unless the condition is kept in mind. Further one must remember that the picture has two aspects: that of the osteoid-osteoma proper and that of the perilesional reaction. The tumor itself usually is visualized as a small rarefied area, although, if it has become sufficiently calcified, it appears as a relatively radiopaque nodule. The osteoid-osteoma is surrounded by an area of rather marked osteosclerosis.

Surgical excision of the lesion and some of the surrounding bone has resulted in prompt clinical

cure. No recurrences have been observed in series years of experience with the lesion.

This condition has commonly been misclassified as sclerosing non-suppurative osteomyelitis or cortical bone abscess. In clear and logical discussion, the authors present their reasons for classifying osteoid-osteoma as benign bone neoplasm and considering it as distinct clinical entity.

D. ARL H. LEVITSKY, M.D.

Muscolo, D. T. Giant-Cell Bone Tumors (Tumors osseos celsis gigantes). *Rev. de chir. y ortoped.* 940, 930

After a historical review and lengthy description of the cause, pathogenesis, and macroscopic anatomy of giant-cell tumors and a description of the histological findings, the author discusses their symptomatology, evolution, prognosis and treatment and arrives at the conclusion that one important question has not yet been answered: Is the lesion of an inflammatory or neoplastic character? Or is the process essentially benign or susceptible to malignant degeneration? Results of endocrinological studies are suggestive of alterations in the parathyroid glands. The author accepts Ewing's classification of giant-cell tumors, is (1) benign, essentially inflammatory tumors (2) benign tumors with a tendency toward progressive development (3) tumors with an aggressive character and (4) primary atypical formations, with large fusiform or giant cells.

Experience shows that surgical treatment is most efficient. Ten case histories are furnished.

JOSEPH K. NARAT, M.D.

De, M. N., and Tribedi, B. P. Skeletal Muscle Tumor. *Brit J Surg* 940, 257

It is difficult to diagnose tumor of voluntary muscle from cellular picture of highly anaplastic stages alone such as round cells or spindle cells, but whenever there is any suspicion, sufficient number of blocks from different areas should be carefully studied for the possibility of discovering striated element, which should finally clinch the diagnosis of rhabdomyoma.

In the above series number of cases were previously reported as mixed-cell sarcoma and fibrosarcoma, but study of further material revealed the presence of undifferentiated striated element in the tumor mass, which depicted the true nature of these tumors.

In the present series of 11 cases the following are the cellular types that were found: 3 cases of pure myoblastoma, 1 case of transitional type, 7 cases of rhabdomyoma sarcomatodes, and 1 case of simple rhabdomyoma. All the patients were of adult age except 3 aged eight, eleven and thirteen years, respectively. There were 6 cases in females and 5

cases in males Only 2 patients had a definite history of trauma The tumors occurred in the following situations face, 2, thigh, 2, arm, 2, axilla, 2, knee, 1, breast, 1, labia majora, 1, tongue, 1, nasopharynx, 1, and leg, 1

JOSEPH K. NARAT, M.D.

Gordon-Taylor, G On Sarcoma of the Muscles and the Connective-Tissue Spaces of the Limbs *Brit J Surg*, 1940, 28, 1

Sarcoma of the muscles and the connective-tissue spaces of the limbs is an uncommon condition, and is far less frequent than skeletal sarcoma Every age is liable to the development of these tumors, there is no special liability of any decade There is also no difference in the sex incidence

Various types of muscle and connective-tissue sarcomas are illustrated, including rhabdomyosarcoma, fibroblastic sarcoma, spindle cell sarcoma, myosarcoma, and cavernous angioma

These tumors are, for the most part, highly malignant All tumors of the muscles or connective tissue planes of the limbs should be suspected of malignancy and removed widely at the earliest moment A histological diagnosis will thus be attained at a stage of the malignant tumor when surgery or radio-surgery has a brighter prospect of effecting a cure than usually obtains On the other hand, if it be granted that on occasion malignant change in a benign tumor may occur, the removal of an innocent neoplasm is to be regarded as a prophylactic procedure of value, whereby a sinister transformation may have been avoided

A histological diagnosis is of paramount importance as a guide to the treatment of the sarcomas of the muscles and connective-tissue spaces of the extremity, information is thereby vouchsafed as to whether the methods of irradiation therapy are worth a trial, and as to what type of surgery is required Whatever be the opinion entertained as to the dangers of a biopsy, this class of tumor is one in which the therapeutic value of exact histological data more than counterbalances the potential risks incurred by the patient in the acquisition of the information

In regard to tumors of small or moderate dimensions, histological information and a cure may both be obtained by an adequate excision of the new growth, the scalpel being carried through healthy tissues far wide of the tumor In the event of the malignancy of the neoplasm being attested by means of immediate microscopical investigations, radium may be left in the wound after ablation of the tumor The experience of Stanford Cade furnishes indisputable evidence of the value of the employment of radium in this way The utility of postoperative irradiation seems still *sub judice*

If the tumor is demonstrably confined to one muscle or even a group of muscles, the complete removal of that muscle or the muscle mass is indicated If the neoplasm proves to be a rhabdomyosarcoma, amputation is probably best, for the results of less heroic measures are appalling, on the other hand, if

the growth belongs to one of the other varieties of sarcoma, surgical excision, radium, or radiosurgery may suffice

If the tumor is of such a size that an attempt to remove it would obviously involve a mutilating operation or would engender grave doubts of its really effective extirpation, a biopsy must be performed by incision of the tumor It is perhaps desirable that such a biopsy be preceded by radiation (Radiumhemmet) When the tumor proves to be of a radiosensitive variety, irradiation may be tried, if of a radioresistant type, amputation at an appropriate site should be performed

In amputation at the hip-joint and shoulder-joint it is important that the muscles be cut short Fore-quarter amputations are devoid of operative mortality in competent hands, and the fatality of the hindquarter amputation is not too grievous when one recalls the prospects of a patient with a high sarcoma of the lower limb, results seem to justify the performance of the operation

In the case of a recurrent tumor a wise discrimination must be employed with regard to the advisability of further conservatism or amputation In a case of repeated recurrence amputation is to be counselled before it is too late

The frequent history of repeated local operation and the end-results of conservatism suggest the propriety of more drastic surgery, especially amputation of the limb at an earlier date than has been customary heretofore

Except in the case of obvious lipomas, the operation of enucleation should be barred, however enticing this procedure may be by reason of its simplicity The capsule in cases of sarcoma of the limbs is a spurious structure, and microscopical evidence of the presence of islets of malignant cells outside the capsule has often been demonstrated

The prognosis is best in those cases in which the initial stages of development have been latent or tardy, the cases in which the beginning is rapid continue to run the most hurricane course

The curious fact that unoperated or untreated sarcomas die without evidence of metastases should not stay the hand of those called upon to treat The life history of such untreated cases is usually only a few years, whereas cures of twenty years and more have been attained by surgery

This paper may afford some guide to the geographical habitat of the more characteristic specimens illustrating sarcomas of the muscles of the limbs and of the connective-tissue planes of the extremities in the museums of Great Britain

SAMUEL H. KLEIN, M.D.

Carrell, W. B., and Childress, H. M. Tuberculosis of the Large Long Bones of the Extremities *J. Bone & Joint Surg.*, 1940, 22, 569

Tuberculosis of the shafts of the long bones is rare in the United States only 32 cases have been reported previously in the English literature. The authors present 4 new cases of their own and discuss,

In addition, 74 hitherto unreported cases which were uncovered by a questionnaire sent to 5 orthopedic surgeons in the United States and Canada.

The bones chiefly involved were the tibia (30 per cent) and the femur (27 per cent). Among 95 patients, 14 had multiple involvement. The third decade of life appeared to be the most common age period of onset. The chronicity of the disease is manifested by the fact that nearly half of the patients had had symptoms for over a year. Active pulmonary and other tuberculous lesions are frequently associated with shaft tuberculosis.

In cases without sinuses, the treatment of choice is curettage or sacroplasty and closure. If sinuses are present, sacroplasty and packing is an effective treatment. In the reported series the treatment most frequently used was incision and drainage, partly because of an early diagnosis of pyogenic osteomyelitis.

From a differential diagnostic standpoint the conditions to be considered must include syphilis, pyogenic osteomyelitis, coccidioid infection, fungoid's disease, and Bock's sarcoma.

DANIEL H. LEVINE, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

GILL, A. B., Key, J. A., Amberson, J. B., Jr. Swift, W. E., and Others. The Treatment of Tuberculosis of the Spine. A Symposium. *J Bone & Joint Surg* 34a, 795

GILL. The purpose of this symposium is to discuss the differences of opinion among the authors as to methods of treatment of tuberculosis of the spine, and to arrive at a better understanding of the nature and cause of this chronic disease to observe and comprehend its phases, variations, and relations to other conditions of the body and to ascertain whether or not all that might be done to aid nature in the cure of tuberculosis of the spine is being done.

It is true that the foci in soft tissues and in bones may become permanently healed, but it is also true that within twenty years from the onset of Pott's disease many patients die of causes directly attributable to tuberculosis, such as pulmonary, meningeal complications. Other complications develop regardless of the primary treatment for the tuberculosis of the spine; they include such conditions as spastic paralysis, renal involvement and foci in other bones and joints.

The objectives of treatment should include the relief of pain, the healing of the vertebral lesion, the prevention or cure of the deformity so far as this may be compatible with healing, the prevention of relapse or of recurrence of the disease in the spine or elsewhere, and the prolongation of life.

Several pertinent questions asked by the author in relation to the objectives of treatment are: should regard these cases simply as an orthopedic problem of localized tuberculosis of the spine to be cured

in one year or in five years or should we keep these patients under observation and guidance for many years as does the internist in treating pulmonary tuberculosis? Can we ever forget that the disease is lurking danger unless the body maintains continually a high level of resistance? Is the last analysis, is the local treatment, however valuable, of greater importance than the general treatment of the body as a whole?

Key discusses the pathology of tuberculosis of the spine. It is generally believed that the tubercle bacilli reach the bone in Pott's disease as in other forms of skeletal tuberculosis through the blood stream usually from foci in the peribronchial or retroperitoneal lymph glands. However according to Fraser it is possible that the thoracic duct and its related lymphatics act as conveying routes. Regardless of the route of transmission, the tubercle bacilli reach the area which is to become the site of disease settle there, and multiply. As the bacilli increase in number there is a reaction in the surrounding tissues. Key gives an excellent detailed description of the various microscopic and gross tissue reactions to the tubercle bacilli.

In tuberculosis of the spine it is usual to classify the cases as of the central, epiphyseal, or anterior types. A series of 60 lesions in 60 patients studied by Doub and Badgley the disease is central in 6, epiphyseal in 4, and anterior in 8. It is usually stated that the localization of these various sites in the vertebral bodies is determined by the arrangement of the blood vessels, but this is not satisfactory explanation and it is still unknown why the spine is peculiarly susceptible to tuberculosis.

In the central type of disease the anterior cortex is usually broken through and the infection spreads beneath the anterior longitudinal ligament to adjacent vertebrae but it may break through the posterior cortex and posterior longitudinal ligament and completely encircle the dura. This type is usually not diagnosed until considerable destruction has occurred because symptoms are late in appearing.

In the anterior type the spread of the disease is similar to the central type and there is little damage to the intervertebral discs or collapse of any vertebral body until late in the disease. The epiphyseal or intervertebral articular type causes symptoms relatively early and can be diagnosed in the roentgenogram by narrowing of the intervertebral space. It rarely causes collapse of vertebral body and it may heal without appreciable deformity.

Abscesses which arise above the diaphragm tend to remain in the chest cavity or to point posteriorly. Those which arise below the diaphragm tend to enter the pelvis along the sheath of the iliopectineus muscle and may point in the groin or thigh, or they may burrow posteriorly and appear in the lumbar region. Paraplegia occurs in about 10 per cent of the cases with Pott's disease.

In children the remains of vertebral bodies which are in contact tend to fuse with bone. In adults the fusion is usually of dense fibrous tissue.

It is probable that no tuberculous spine ever heals completely and that there always persist foci of disease, which may become active if conditions arise that sufficiently favor the disease. Key believes that spinal fusion tends to lessen the probability that such conditions will arise and to hasten the healing process if it is done without lowering the patient's resistance too much.

AMBERSON states that tuberculosis of the spine is almost exclusively due to infection with the human type of bacillus. Infected cattle in the United States cause only 0.4 per cent of the cases. With very few exceptions, infection is acquired by inhalation and the primary lesions are pulmonary. The younger the child is, the larger the lesion of caseous lymphadenitis and the greater the liability to hematogenous dissemination. In older persons, particularly those beyond the age of puberty, the greater is the tendency to localization in the lungs, while the tendency toward hematogenous spread is less.

Tuberculosis of the vertebral column accounted for 698 deaths in the registration area of the United States in 1937, 431 in men and 267 in women. This represents approximately 1 per cent of the deaths from all forms of the disease and approximately 12 per cent of the deaths from extrapulmonary tuberculosis.

Whitman reported in 1927 that in 85.8 per cent of the cases the disease developed before the age of ten years. Hellstadius more recently indicated two peaks of incidence, the first between birth and the age of nine, and the second between the ages of twenty and twenty-five years.

Randerath almost invariably found the bone marrow to be invaded in acute generalized milary tuberculosis, and Koizumi demonstrated tubercle bacilli in the bone marrow in 75 per cent of a series of cases of chronic visceral tuberculosis. If the patient survives, most of these foci become healed or latent, and constitutional or local influences later may be responsible for the exacerbation of some of them. Trauma, for example, may cause reactivation of such a latent focus. Few believe now that the effect of trauma is to establish a focus of lowered resistance in which circulating tubercle bacilli are likely to lodge.

Cave reported that 60 per cent of 122 children with vertebral tuberculosis showed pulmonary lesions at some time during the course of the disease as demonstrated by roentgenograms. Von Hecker found a similar percentage but only 5 per cent of his patients were from twenty-two to twenty-four years old. In negroes, vertebral tuberculosis is a more frequent, serious, and fatal disease than in white individuals.

In the presence of vertebral tuberculosis, a source in the chest should always be assumed and sought, as well as hematogenous lesions in other systems, such as the serous membranes, the lymphatics, and the genito-urinary tract. It is important to recognize these lesions at any time, but especially during

the early stages of vertebral disease. Periodic roentgenographic examinations of the chest should be made at frequent intervals, and the urine should be examined regularly for traces of albumin or pus. Suggestive evidence should always lead to further investigation. Too much reliance should not be placed on the observation that vertebral tuberculosis sometimes runs its course as an isolated lesion. Symptoms of toxemia are to be watched for and it is invaluable to make periodic observations of the erythrocytes, sedimentation rate, and blood leucocytes.

There is no substitute for general rest and rest of the local lesion in tuberculosis. Rest treatment should include, as far as possible, the elimination or minimization of such deleterious influences as malnutrition, fatigue, worry, menstruation, pregnancy, and associated diabetes.

Diet is now considered to be important in tuberculosis only in so far that it provides all the necessary elements in suitable amount and quality and that the food is well prepared and tastefully served.

Except for certain superficial tuberculous lesions, it is doubtful whether natural or artificial heliotherapy is lethal for bacilli in the tissues or that it accelerates healing in a specific way.

Attention is called to the principle that in any form of tuberculosis surgical treatment usually is most effective ultimately if it is postponed until the forces of resistance have become organized and the lesion has been stabilized and has started to heal. Surgical treatment may be futile and harmful if started prematurely, especially if the disease is still in the phase of hematogenous dissemination.

SWIFT discusses the *end results of treatment*. Fusion operations for tuberculosis of the spine were performed on 817 patients in the twenty-year period from 1911 to 1930. Seventy-one per cent of the patients were followed up for at least five years, of these, 61 per cent were followed up for periods of from ten to twenty-four years. The Hibbs' type of spine fusion has been the treatment of choice.

Excellent results were obtained in 72 per cent of the children and in 53 per cent of the older patients. The patients who are in good general condition clinically and whose roentgenograms show the tuberculous lesion to have entirely subsided are listed as having excellent results. A relatively normal appearance of the diseased bone is the ultimate end-result expected to occur after a successful spine fusion. When this point is reached the danger of a recurrence of active tuberculosis in that area is not feared. If roentgenographic evidence of a lessening of the disease activity is not present in from six to eight months, either the fusion is not solid or some unknown factors are stronger than estimated. It is expected that paravertebral abscesses will tend to disappear if they are dependent for their contents on the activity of the vertebral lesion, which effect is frequently observed as early as the fourth month. The average period of recumbency following a spine fusion should be from six to twelve months. Fifteen

per cent of the 584 patients died of tuberculosis this means that 33 per cent of all the deaths were caused by some form of tuberculosis. Eight patients of the 584 died of shock or infection.

The demonstrable and expected benefits of successful spine fusion re rest to the diseased area evidence of the activity of the lesion at an early date maintenance of the kyphosis at the minimum degree of deformity growth of the vertebral bodies in the fused area in children possibility of the patient's being ambulatory at an early date and attainment of a permanent healthy roentgenographic appearance of the diseased vertebrae.

CLEVELAND states that attempt to study a single manifestation of disease so protein as tuberculosis is difficult and perhaps unwise. It is his belief that the answer to the problem of joint tuberculosis, including tuberculosis of the spine, lies not in methods, techniques, surgical procedures, or alpine sunlight, but in more fundamental and often ignored factors, that is, the extent of invasion by the tubercle bacillus and the patient's reaction to this disease.

The patients were divided into four groups according to the degree of involvement by the disease.

Group A Patients with no evidence of pulmonary tuberculosis. The mortality rate in this group was 4 per cent. Death usually occurred from prolonged suppuration and attendant amyloid disease.

Group B Patients with pulmonary tuberculosis and negative sputum, but with no metastatic spread to other organs. The mortality rate here was 7.14 per cent.

Group C Patients with pulmonary tuberculosis and positive sputum. The mortality rate in this group was 44.44 per cent.

Group D Patients with pulmonary tuberculosis and negative sputum and with metastatic spread to other organs. The mortality rate among these patients was 68.75 per cent. They are apt to have an invasion of the gastro-intestinal or genito-urinary tracts lymph glands, and often military tuberculosis ultimately develops. There is no certain means of recognizing these conditions until they have declared themselves definitely. Once they are established it is foolhardy to attempt any surgery except of a palliative nature. As the development of metastatic spread in these patients has been observed in the wards prior to any surgery it is very doubtful if the surgical procedure plays any part in dissemination of the disease.

Since Groups A and B showed a combined mortality of 9.3 per cent and Groups C and D showed mortality of 54.54 per cent, it is obvious that the success or failure of any type of treatment, in given series of cases, all depend upon which groups form majority of the patients in that series.

The death rate was high, 26.6 per cent in the 203 consecutive patients in this series. The eight bearing joints were involved in about 95 per cent and the vertebral joints 5 per cent of all instances

of joint tuberculosis. Forty-eight of 203 patients gave evidence of spinal-cord compression. Spinal fusion and prolonged bed rest offer the best means of treatment. Paravertebral, mediastinal, or psoas abscesses are present in a very high percentage of the patients. Repeated aspiration is the treatment of choice although incision and drainage with closure of the wound may be necessary. Spontaneous fusion requires many years and usually entails serious deformity of the spine and in the end these patients are not adequately protected against the disease. Fusion by surgery accomplishes from six to nine months what it takes not rest achieve in from five to six years. It is likely that an incidence of at least

per cent of failure of fusion may be expected in the hands of experienced surgeons and that with lesser experience the incidence will be higher.

The end results in the reported 203 consecutive cases of tuberculosis of the spine treated by spinal fusion are excellent in 54.8 per cent of the cases, which are followed up for an average of three years and ten months and uncertain in 9.1 per cent, followed up on the average of two years and eight months. Death occurred in 26.6 per cent at a average of thirteen and one-half months after operation.

In this series 6 per cent of the patients are in the more favorable Groups A and B. The 33 per cent in Groups C and D are carefully selected for surgery. This should be borne in mind, as any indiscriminate selection of patients for surgery from the less favorable groups will result in an appalling mortality.

There are 50 patients who are followed up for five years or more. Of these 43 died, each six years after operation. The remaining 43 had excellent results and are followed up for an average period of slightly more than seven years.

Healing of vertebral lesions is accomplished by fusion either of the vertebral bodies or of the laminae with recalcification of the diseased bodies and subsidence of clinical symptoms. The diseased vertebrae tend to settle together until sound or recalcified bodies are in contact.

The patient's general reaction to tuberculosis is the most important single factor in healing. If he falls into Group A or B his chances of healing are excellent if he belongs to Group C his chances are fair or good, and finally if he falls into Group D, his chances are poor.

The cause of death is usually tuberculosis. In a small group of 50 patients with excellent results, with an average follow-up of seven years, only died of tuberculosis after six years.

MIXTER-SILVER. Although a diagnosis of tuberculosis of the spine was made in 2030 patients surgical fusion as performed on only 430 patients (3 per cent). In this group of 430 patients, the average age was more than thirty years and the average duration of the symptoms 21.1 and one-half years more than 5 per cent of these patients had not had previous treatment. Thus, this constitutes a series

of cases that differ in type from those reported by some authors working in other orthopedic centers. Of 480 patients, only 4 per cent were children, operation having been carried out principally during the earlier years of the author's experience. Spinal-fusion operations are rarely done on children at the present time because conservative measures are preferred.

When fusion is produced, the region of involvement in the spine is immobilized, thus effecting something which no other form of fixation, such as that obtained by means of plaster jackets, braces, or recumbency, can bring about. In such cases, respiratory motion and other muscular movements no longer add their trauma to an already diseased tissue.

Operation to produce surgical fusion of the spine is a comparatively safe procedure. It may be performed without danger of aggravating the disease process. It aids in giving stability to the diseased portion of the spine. It does not necessarily prevent extension of the disease, formation of abscess, irritation of the spinal cord, or paraplegia among patients whose resistance is not good. It is best to delay spine fusion in children who are sick, then, when the process becomes quiescent, it can be employed to obtain an internal splint to aid in ankylosis. The results of spine fusion as a treatment for tuberculosis of the spine are probably better in adults than in children. An operation that produces fusion of the entire region of involvement gives better immobilization and, consequently, better results than does one that effects fusion of a more limited region. It is often impossible, in the early stages of tuberculosis of the spine, to determine the exact extent of the process either by clinical or by roentgenographic examination.

At the end of five years, 396 of 480 patients had been traced, of these 396, 63.64 per cent had returned to an occupation, 78.3 per cent showed improvement in their condition, 3.79 per cent had shown temporary improvement, and 18.43 per cent had died.

The best results are obtained when patients are carefully selected for operation, when spine fusion is employed during the period of healing of the disease, and when such treatment is reinforced by conservative treatment for a prolonged period of time.

The paramount requirement for every patient who has tuberculosis of the spine is rest, heliotherapy and a nutritious diet. No surgical treatment can offset the value of conservative treatment.

In addition to his report Meyerding has included an excellent review of divergent opinions as expressed in the literature on various factors involved in the treatment of tuberculosis of the spine.

CHANDLER and PAGE selected 39 consecutive cases for their study. These cases were studied and compared with 36 cases treated conservatively during a previous five year period. Final end-results could not be obtained in some instances. The Hibbs technique was used in all cases. Sections of rib or tibial grafts supplemented by bone chips at the site

of pseudarthrosis were used in 4 cases in which secondary operations were done. One patient was operated upon three times.

Good results were obtained in 25 cases (64.10 per cent). In 4 cases (10.26 per cent) in which the patients were followed for only three years the results were good at the end of the observation period. In 3 cases (7.69 per cent) there was continued activity of the disease, and in 1 case of paraplegia (2.56 per cent), there was some return of motor function. There were no deaths due to operation. Six deaths (15.39 per cent) occurred in the total series of 39 cases. All were caused by tuberculous lesions and occurred from four months to five years following operation.

The authors agree with all the accepted nutritional, hygienic, and supportive measures, and, with some reservations, with the principle of rest. They seek the amount of rest compatible with normal physiological functioning of the patient as a whole. Absolute rest is accompanied by atrophy even of normal structures and necessarily by impairment of their normal physiology. Frequent postural changes and active use of the extremities are encouraged. Every effort to splint the area of disease itself is carried out. This can be done best by surgical fusion of the involved area of the spine, provided the operation is not shock-producing or devitalizing to the patient.

At best a spinal fusion is only a part of the treatment of tuberculous spondylitis. The authors believe that it has been helpful. They do not use the term "cured" because this means that the follow-up in a case of tuberculosis of the spine should be life long.

An analysis of 63 cases of tuberculosis of the spine, in patients all under twelve years of age, is the basis of ADAMS' report. The percentage of deaths was 40 and that of recoveries 60.

Careful thorough fusion of the laminae produces an internal splint and is an aid in the healing of the disease. The fused areas will bend, and no weight should be put on the bodies in the center of the kyphos until the healing is well advanced. No operations were performed until the general condition was improved. The types of fusing operations used were the Hibbs and Albee, osteoperiosteal grafts were also used. Laminectomies were done in some instances.

In tuberculosis of the lumbar spine in children, when the process apparently has started in the disc and has invaded the bottom of the vertebra above and the top of the vertebra below, solid bony fusion will result in two or three years, without any operative interference. The use of sulfanilamide in these cases is not warranted. It clears up the intercurrent infection, if there is a mixed infection, but it does not attack the tuberculous organism because of its waxy capsule.

Eighty cases were reviewed by Harris and Coulthard and the data so obtained is the basis for this report. Spine fusion is of value because, prop-

erl performed it maintains rest in the diseased segment of the spine more efficiently than does any other method and it does so for the remainder of the patient's life. It is the authors' opinion that rest obtained by spine fusion ensures more rapid cure of Pott disease with greater certainty and less likelihood of recurrence than any other form of treatment.

The basic plan has been to treat the patient by recumbency and fixation for a length of time sufficient to enable him to obtain mastery of the infection. The Whitman frame has been found to be the most convenient apparatus on which to carry out this regimen. During this period of recumbency the spine is fused. Fusion is not undertaken until the patient shows signs of mastering the infection, and at least six months must elapse after fusion before it is safe to allow him to get up. Favorable cases are recumbent for a year during the middle of which period spine fusion is performed. Three months ambulatory treatment follows so that the minimum period of hospital treatment in favorable cases is about fifteen months. A variety of circumstances may necessitate lengthening the period of recumbency. The presence of persistent pyogenic abscesses, tuberculous abscesses, or discharging sinuses which interfere with the field of operation, and of foci of tuberculosis elsewhere in the body and failure of the patient to display evidence of mastering the infection rapidly all necessitate longer treatment.

Fusion is obtained by using large and relatively heavy bone grafts. For this purpose two grafts are taken from the shin. They are turned on edge and their cancellous surfaces placed against the denuded spinous processes of the involved vertebrae and of one normal vertebra above and one below. Cancellous bone and chips, also taken from the tibia, are packed into the interstices of the field of operation. The two large grafts are fastened in place by stainless-steel wire sutures through the upper and lower ends. This operation has the advantages of simplicity and rapidity while it ensures rigid fixation of the involved segment of the spine.

Healing is classified into four types:

Healing by bony ankylosis. In this type the remnants of the involved vertebral bodies have fallen together and have fused into a solid pyramidal mass of bone which represents what is left of the diseased bodies. The bone graft is solidly fused to the spaces of the involved vertebrae and to at least one normal vertebra above and below. The patient presents clinical evidence of cure, normal temperature, no pain, ability to undertake reasonably heavy activity, the abscesses disappear and the sinuses close and dequar weight is maintained. One can say with great certainty that the patient is cured.

Healing by firm fibrous ankylosis. The involved vertebral bodies (usually only two) do not fuse with bone. They are separated by narrow space occupied by the remnant of the intervertebral disc. The space is small and the spinal bone graft is solid and of adequate extent. The clinical evidence of cure is

as already stated. Probably these cases represent just as perfect cures as do the previous group, although the roentgenogram lacks the definite evidence found in the group with bony ankylosis.

Healing without ankylosis—stable joint. The vertebral bodies are separated by a considerable space due to too much hyperextension of the spine at the site of the disease, calcific debris from an abscess, or sequestrum. The bone graft is fused to an adequate number of spinous processes but it may fracture at the level of the disease because the involved bodies are not stable and great strain comes upon the graft. The clinical evidence of cure may be present or there may be pain on effort. If the graft fractures, exacerbation of the disease may result.

Failure to heal or extension of the disease. The outstanding feature is progressive curves in the grafted area or extension of the caries into vertebral bodies beyond the bone-grafted area. The clinical evidence of active disease including abscess, is present.

Abscesses occurred in some 15 per cent of the cases. The authors gradually extended the field of aspiration and now use it for the mediastinal abscess. This must be done under roentgen control and is not easy but yields valuable diagnostic information and materially aids in the treatment. Heliotherapy is regarded as most valuable adjunct in most cases. Abscesses are treated by repeated aspiration, whenever possible. Usually this is sufficient to dispose of the abscess although occasionally it evolves to increase in size in spite of aspiration. In such cases external drainage is utilized (drainage through small round base continuously antiseptic dressing made with Keith's solution). The glycerin base ensures its remaining in place for at least twenty-four hours. Secondly infected sinuses are difficult to treat and only occasionally are they cured. The authors have had some success by irrigating the sinuses with Dakin's solution, and one in which the secondary organism was the hemolytic streptococcus was cured with sulfamidamide. Amyloid disease occurred in 3.75 per cent of the cases. The diagnosis was made by an improved Congo-red test. Renal or genital tuber-

TABLE I.—ANALYSIS OF THE RESULTS OF TREATMENT

Result	Method				Total	
	Recumbency and bone graft		Recumbency only			
	Cases	Per cent	Cases	Per cent	Cases	Per cent
Bony ankylosis		54.00	23	40	77	60.00
Firm fibrous ankylosis	00	20.00	23		23	
No ankylosis		00	30.00		30	23.75
Progressive disease		6.25	10	34	16	12.50
Total	00	100.00	56	100.00	56	100.00



Fig. 1 Healing without ankylosis of the vertebral bodies. Unstable spine. In this example although the bone graft is solidly fused to the spinous processes the vertebral bodies are separated by hyperextension and consequently all the stress of weight bearing comes upon the bone graft.

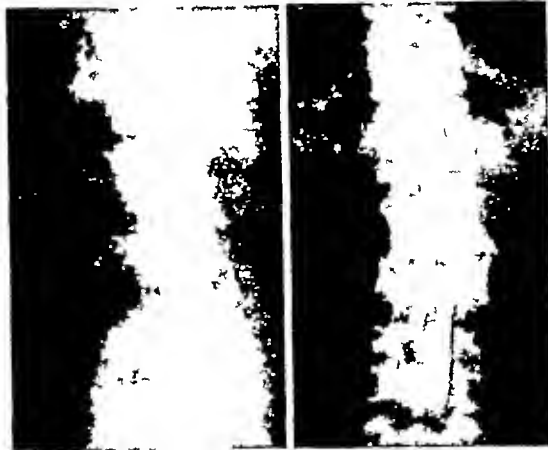


Fig. 2 Fifteen months later the strain upon the bone graft resulted in its fracture with collapse of the vertebral bodies into one another. This was followed by an exacerbation of activity of the disease which was treated by further recumbency and a second bone graft. The fracture in the first bone graft healed spontaneously, with ultimate bony fusion.

culosis occurred in 26.25 per cent of the cases. Routine examination of the urine for tubercle bacilli is as much a part of the management of a case of bone and joint tuberculosis as is examination of the chest. Addison's disease was present in 3.75 per cent and paraplegia in 16.25 per cent of the cases. No cases of paraplegia occurred in Pott's disease of the lumbar vertebra. In 2 cases it occurred during the period of immobilization at a time when the active disease in the bone seemed under control and in 3 additional cases it occurred several years after the Pott's disease was apparently cured. This complication is obscure in its exact pathology and its treatment is difficult and uncertain. Active pulmonary tuberculosis as a complication in 30 per cent. The general mortality in the 50 cases was 8.75 per cent. In the group treated by bone grafting the death percentage was 1. Tuberculosis in various forms was the chief cause of mortality. The conservatively treated group of 30 patients had a mortality of 56.67 per cent but the 6 patients included a high proportion of unfit surgical risks.

Among the relapses or severe complications occurring after healing were 9 cases of fracture of the bone graft. In 1 case with exacerbation of activity immobilization and a second graft were required. Ultimate cure resulted. The remaining 8 patients had few symptoms and required no special treatment. The fractured grafts all united. This may mean a high incidence of fracture of the graft. It can be explained as follows.

The author have been diligent in the postoperative examination of the cases and have made careful roentgenographic studies of the graft areas central part of the review. Moreover, the type of graft used helped it all well to visualization of the roentgen o-

gram. The large double grafts from the tibia show well, and if they are fractured this also shows more clearly than in the usual Hibbs or Albee technique. Several of the fractures were discovered only on roentgenographic review, the patients had made no complaint and nothing in the clinical examination suggested fracture. The authors believe that the spine should be fused with the diseased bodies in contact even though this means the existence of a certain amount of deformity. (See Figs. 1, 2, 3.)

Sixty-six cases were observed by Mayer and spine fusions were done in 37 while 29 were treated conservatively. In studying this group of operative and non-operative cases, care was taken to classify the patients as accurately as possible with regard to duration of the disease, the number of vertebrae involved, the presence of abscess and age. This study was based on a fifteen year observation period.

It is impossible to make a positive diagnosis of tuberculosis of the spine in the early stage since other diseases may give similar symptoms, physical signs, and roentgenographic appearance.

Since spine fusion involves only the laminae and the intervertebral articulations and because the healing of the invaded bodies usually takes place by the so-called block process in which a fusion of one or more bodies occurs, the operative fusion will tend to interfere with the natural process of healing if performed at a stage antedating the pathological fusion of the bodies and if the fused laminae prevent it. The operative fused area bends approximately 10 degrees or more.

Exactly the same pathological changes may and do occur in the fused area in the unfused cases. The general treatment is more important than the local

erly performed it maintains rest of the diseased segment of the spine more efficiently than does any other method. It does so for the remainder of the patient's life. It is the author's opinion that rest obtained by spine fusion ensures a more rapid cure of Pott's disease, with greater certainty and less likelihood of recurrence than any other form of treatment.

The basic plan has been to treat the patient by recumbency and fixation of length of time sufficient to enable him to obtain mastery of the infection. The Whitman frame has been found to be the most convenient apparatus on which to carry out this regimen. During this period of recumbency the spine is fused. Fusion is not undertaken until the patient shows signs of mastering the infection and at least six months must elapse after fusion before it is safe to allow him to get up. Favorable cases are recumbent for a year during the middle of which period spine fusion is performed. Three months ambulatory treatment follows so that the minimum period of hospital treatment in favorable cases is about fifteen months. A variety of circumstances may necessitate lengthening the period of recumbency. The presence of persistent psoas abscess or lumbar abscess, of discharging sinuses which interfere with the field of operation and of foci of tuberculosis elsewhere in the body and failure of the patient to display evidence of mastering the infection rapidly all necessitate longer treatment.

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Failure to heal or extension of the disease. The outstanding feature is progressive caries in the grafted area or extension of the caries into vertebral bodies beyond the bone-grafted area. The clinical evidence of active disease including bacera, is present.

Abscesses occurred at some stage in 90 per cent of the cases. The abscess gradually extended the field of aspiration and now use it for the mechanical bacera. This must be done under roentgen control and is not easy but yields valuable diagnostic information and materially aids in the treatment. Heliotherapy is regarded as most valuable adjunct in most cases. Abscesses are treated by repeated aspiration, whenever possible. Usually this is sufficient to dispose of the abscess, although occasionally it continues to increase in size in spite of aspiration. In such cases lumbosacral drainage is utilized (drainage through a small wound into a continuously antiseptic dressing made with Kelik solution). The glycerin base ensures its remaining effective for at least twenty-four hours. Secondly, infected sinuses are difficult to treat and only occasionally are they cured. The thorax has had some success by irrigating the sinuses with Dakin solution, and case (in which the secondary organism was the hemolytic streptococcus) as cured with sulfanilamide. Amyloid disease occurred in 3.75 per cent of the cases. The diagnosis was made by an improved Congo-red test. Renal or genital tuber-

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Firm fibrous ankylosis	10	33.33	22		32	73.33
No ankylosis		00	10.00		10	22.22
Progressive disease	6.00	19	1.21	3.33	7	15.56
Total	20	100.00	22	100.00	42	100.00

does not appear. On the other hand, the so called direct phosphorus increases when the water content of the callus is considered. At the same time these fractions, when compared with the phosphorus associated with the calcium, are very small, and this latter phosphorus corresponds practically with the entire increase of the phosphorus content. It appears, therefore, that calcium and phosphorus are taken up directly from the blood in the process of ossification.

These studies have also shown that the phosphorus content of the blood plasma (probably lipid and residual phosphorus) increases, in contrast with the calcium content in the formation of callus.

The increase of the insoluble carbonate occurs in the ossification of the callus only at a later stage than the increase of the calcium and phosphorus. On the other hand, the increase of the bicarbonate content is distinctly discernible even in the early stage. The bicarbonate is probably associated with the formation of carbonate and also exerts a favorable, local, alkalizing effect. The pH determinations (both by electrometric determination and by gasometric calculation) show that with increasing age of the callus there results a considerable alkalization (from about pH 7.5 on the fourth day to about pH 9 on the twenty-fourth day). This alkalization (the conditions of which were not entirely explained in this study) partly favors the precipitation of tertiary calcium phosphate directly and partly favors the effect of the phosphatase.

The well known fact that the phosphatase content of the callus tissue is considerably increased could also be confirmed in this study.

LOUIS NEUWELT, M.D.

Wilson, J. C. Fractures of the Neck of the Femur in Childhood. *J. Bone & Joint Surg.*, 1940, 22: 531.

The author presents 10 cases of fracture of the femoral neck in children following end result studies to show the dangers which follow such injuries and

to suggest treatment. Seven patients were males. Four were in the first decade of life and 6 in the second. In only 1 case was trauma slight and in this case there was a paralyzed extremity. All fractures occurred centrally or near the base of the neck. Eight of the patients were treated with a Whitman cast. In 7 instances satisfactory reduction was not maintained. The slipping of the fragments was discovered in 1 case early enough to allow correction and transfixion of the shaft of the femur by a pin which was incorporated in the cast. In 1 patient the femur was nailed, but, through no fault of the procedure, the case terminated unfortunately. An oblique subtrochanteric osteotomy was done in 1 case in which the hip was dislocated, because of muscle weakness following infantile paralysis. It was hoped that the osteotomy would stabilize the hip and facilitate healing of the fracture, both of which results were accomplished. One patient with non union of the fracture died from shock the same day an intramedullary bone grafting was done. One of the 9 remaining patients was injured only two months previous to the report so that the outcome cannot be anticipated. Of the remaining 8 patients, 2 have good functional results.

Fractures of the neck of the femur in childhood are serious injuries. Maintenance of reduction in the Whitman cast is difficult. Perhaps a nail would be more effective, but there is a possibility that the epiphyseal plate may be damaged by its use. Growth changes are to be expected although they do not conform to the classic picture of Legg Calvé-Perthes' disease as has occasionally been reported. Irrespective of the cause for the growth disturbances, direct injury to the vascular supply or to the nerves controlling the blood vessels, gross disturbance of joint mechanics usually follows. Such joints must show premature evidence of wear and tear, which is commonly called degenerative arthritis. Oblique subtrochanteric osteotomy is helpful in bringing a limited arc of motion into useful planes.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Efskind, L. Vascular Changes after the Intravenous Injection of Thorium Dioxide (Thorotrast) (Vaskulære Forandringer efter Intravenøs Injektion af Thoriumdiøxyd (Thorotrast)) *Acta chirurg. Scand.* 1925, 54, 77

Efskind's studies on vascular changes after the intravenous injection of thorium dioxide (thorotrast) originated from the questions: (1) Are the mesothelium of the peritoneum and the vascular epithelium which cannot be differentiated histologically identical biologically with regard to their behavior following the injection of thorotrast? and (2) Is the intravenous injection of thorotrast clinically harmless? The studies were carried out on 3 rabbits which received 3 c.cm. of thorotrast injected into the auricular vein and were examined from one to one hundred and sixty days after the injection. The author's findings were as follows:

Thorotrast is deposited rather fast in the cells of the reticulo-endothelial system. Although there is no definite deposition of thorotrast or other vital pigments in the vascular epithelium, the former is nevertheless deposited in large amounts in the peritoneal epithelium, after intraperitoneal administration.

After single intravenous injection minor signs of degeneration appear in the vascular epithelium at the end of the first day. They consist of pyknosis and disappearance of the chromatin structures, thus followed by shrinkage of the nucleus, and later also by changes of its form, as the first signs of a segmental nuclear sclerosis. More advanced stages bring changes of the cell body as well, with disappearance of the cell borders. The peak of the degenerative changes after the injection of thorotrast occurs on the second day when vacuolization in the cytoplasm is also found. These changes are usually reversible and the death of the cell is rare. When it does occur, the defect seems to be closed by changes of form and volume of the surrounding cells, not by mitosis. After one week the changes have completely disappeared and even after prolonged observation no proliferative or degenerative changes of the vascular endothelium can be found. On the other hand, the author has found changes in the peritoneal mesothelium months after the intraperitoneal injection of thorotrast.

As to the other layers of the vascular wall, thorotrast deposits are frequently found in the intima. They may reach a size of 1 by 2 cm. and may lead to destruction of the elastic substance of their wall.

Therefore the vascular walls are not indifferent to thorotrast, small, but distinct, degenerative changes follow its injection. In addition marked deposits with destruction of the elastic substance in the media are frequently found in the experimental animals.

the deposits are found especially at the sites of local injury (in an experimental puncture wound and a narrowing of the lumen) and it is likely that pre-existing vascular diseases increase the formation of these deposits. In veins, degeneration was found, but there were no deposits. Because of their different behavior following the injection of thorotrast Efskind thinks that there is only a morphological resemblance between the peritoneal and the vascular epithelia. Though his experiment does exceed the amounts used clinically in vasography he discovers the use of this method of examination, especially in diseased vessels. HENRIK LARSEN, M.D.

Dodd, H., and Oldham, H. The Surgical Treatment of Varicose Veins. *Lancet* 1925, 30, 2.

When incompetent valves are present in the saphenous veins, high ligation and injection are the procedures of choice for the treatment of the varicosity. The great saphenous vein must be tied at its junction with the femoral vein. In some instances, in addition to the high ligation, it is necessary to divide and inject the great saphenous vein just above the knee. A group of 436 cases form the basis of this report.

The efficiency of the valves of the saphenous vein is determined by the cough, Trendelenburg, and tourniquet tests. These tests are described and discussed in detail. Healing of ulcerations is brought about by complete treatment of the varicosities. If the valves in the saphenous vein are competent, varicose veins will respond to injections alone. Contra-indications to operation or injection are: (1) occlusion of the deep veins as determined by the tourniquet test; (2) arterial degeneration; and (3) pregnancy and pelvic tumors.

In regard to the operation the patient is prepared as for a hernia operation. The veins should be marked beforehand with dye. Local infiltration with 1 per cent procaine is done for anesthesia but gas may be used. The upper end of the great saphenous vein lies under a vertical line dropped from the pubic spine. All tributaries of this vein must be ligated and severed. Each end of the divided vein itself must be doubly ligated with transfusing suture. If the valves between the saphenous veins and deep veins are incompetent, additional ligation of the saphenous vein above the knee is necessary, care being taken to avoid injury to the saphenous nerve. Ligation of the small saphenous vein at its junction with the popliteal vein is necessary in certain cases.

The injection is made through a urethral catheter inserted down the vein. The authors advocate a "1" in injection consisting of (1) quinine and urethane and (2) lithocaine. From 1 to 4 c.cm. of each of these solutions are injected. A 50 per cent solution of sodium salicylate (from 5 to 10 c.cm.)

also makes a satisfactory sclerosing agent "Ethamolin" is inferior to the afore-mentioned solutions. The use of sodium morrhuate is strongly condemned because of the severe local and systemic reactions.

An elastoplast bandage is placed on the extremity from the toes to above the knees for four or five weeks. Any residual varicosities are treated with subsequent injections. LUTHER H WOLFF, M D

Holman, E The Anatomical and Physiological Effects of an Arteriovenous Fistula *Surgery*, 1940, 8 362

That an arteriovenous fistula has profound effects upon the circulatory system is universally recognized, although the explanation for some of these effects is still subject to controversy. Particularly puzzling has been the effect upon the size of the heart, which is said invariably to become enlarged in consequence of the fistula. The author observed, in animal experimentation, that in the first twenty-four to forty-eight hours after the establishment of a large arteriovenous fistula, the heart diminishes in size, and if the animal survives, there is a prompt return to normal, and, subsequently, a gradual dilatation which may be apparent within four or five days. Death due to an excessive diversion of blood through the fistula may occur and is accompanied by a marked diminution in cardiac size. A marked diminution in cardiac size accompanies shock. A marked decrease in cardiac size also accompanies hemorrhage, the diminution in the size of the heart being commensurate with the degree of blood loss. The size of the heart conforms accurately to the volume of blood flowing through it.

The dilatation that accompanies an arteriovenous fistula is not restricted to the heart, but affects the vessels involved in the fistulous circuit. The same cause is responsible for both dilatations, namely, an increase in the volume or bulk of blood flowing through that part of the circulatory system through which the blood short circuited by the fistula must flow, i.e., all the chambers of the heart, the proximal artery, fistula, and the proximal vein.

To determine more accurately the effects of an arteriovenous fistula, experiments were undertaken in the growing animal and revealed that the dilatation may be very great without evidence of decompensation and may be accompanied by pronounced hypertrophy. It is suggested that when dilatation outstrips hypertrophy, decompensation occurs, when dilatation is paralleled by an equivalent hypertrophy, great enlargement and dilatation of the heart may occur without decompensation. In a crucial experiment involving 3 litter mates of equal weight and stature, 1 acting as control, 1 having an aorta-vena cava fistula 12 mm in circumference, and 1 having an aorta-vena-cava fistula 18 mm in circumference, there occurred increases in the blood volume commensurate with the size of the fistulas. In the same animals an increase in the capacity of the circulatory systems occurred, also commensurate with the size of the fistulas. The increase in capacity and

the increase in blood volume closely paralleled each other.

In an animal with bilateral femoral fistulas the increase in blood pressure and reduction in pulse rate were greatest when both fistulas were closed simultaneously, and considerably less when either fistula was closed separately. The physiological effect of a fistula, therefore, clearly depends upon the volume of blood diverted through the fistula, which is determined by its size.

The transient high systolic and diastolic pressures that persist for several days following operative closure of a fistula are due to the increase in blood volume that has occurred during the existence of the fistula. The permanent elevation of diastolic pressure is secondary to the elimination of an area of decreased peripheral resistance.

In animals having bilateral femoral fistulas, venacaval pressures were highest with both fistulas open, least with both fistulas closed, and intermediate pressures were obtained on closing one or the other fistula separately. Venous pressures proximal to a fistula are determined by the volume of blood diverted through the fistula and therefore by the size of the fistula. HERBERT F THURSTON, M D

Arkannikova, A. A. The Ligation of the Femoral and Subclavian Veins as a Method of Treatment of Gangrene of the Extremities *Nov khir arkh*, 1940, 46 114.

Ligation of the femoral vein may occasionally constitute the sole method of treatment of gangrene of the lower extremities, but usually the operation supplements other procedures. Ligation alone is not sufficient because it exerts only a local effect. Anemia and lowered temperature of the involved extremity, accompanied by pains caused by an insufficient blood supply, form the most frequent indications. Alleviation of pain by the lowering of the affected extremity justifies an expectation of good results after the ligation. Conversely, the presence of dilated veins contraindicates ligation of the femoral vein because the dilatation of veins as such demonstrates the presence of stasis, and stasis is the result desired when ligation of the femoral vein is done in order that dilatation of collaterals may follow.

A ligation of the subclavian vein supplementing a ligation of the corresponding artery diminishes the danger of gangrene of the upper extremity by preventing a marked fall of the blood pressure.

JOSEPH K. NARAT, M D

BLOOD, TRANSFUSION

Ahlborg, N. G., and Brante, G. Parallel Investigations into the Ascorbic-Acid (Vitamin C) Content in the Blood Plasma and into the Strength of the Cutaneous Capillaries in Healthy Children *Acta med Scand*, 1940, 104 527.

The ascorbic acid of the blood and capillary fragility of 61 healthy children, from seven to fourteen years of age, were determined, the former by the

Mindlin B ther method, the latter by Goethlin's technique. The Goethlin technique is as follow

The number of petechiae in a small area on the forearm, seen with a 5 diopter lens, after 35 mm. of mercury pressure is maintained for fifteen minutes on both arms is multiplied by and the number of additional petechiae found at least an hour later after 50 mm. of mercury pressure is maintained for fifteen minutes on both arms is added to this figure. The result is called the petechial index (P.I.)

A close negative correlation between the level of the blood ascorbic acid and the petechial index was found in the 61 children. In 6 cases with low ascorbic acid values (0—0.3 mgm. per cent) and elevated petechial index (6—33) raising the blood level by the daily ingestion of 100 mgm. (0.6—0.8 mgm.) resulted in a marked lowering of the petechial index (0—7)

PAGE STARR, M.D.

Scarborough, H., and Thompson, J. C. Studies on Stored Blood; The Oxygen Capacity of Stored Blood. *Edinburgh M J* 940, 47 157

The clinician frequently employs blood transfusion as a therapeutic measure to increase the oxygen-carrying power of the blood of the patient. Fresh blood from healthy female donors has an average oxygen capacity of 7.6 c.c.m. per 100 c.c.m. of blood.

Now that stored blood is becoming readily available and is being used increasingly it is obviously of importance to determine whether or not the oxygen capacity of the blood is influenced in some way by storage.

In the method employed by these authors, the blood was removed from the donors with the closed apparatus described by Stewart. The anticoagulant was 3.8 per cent sodium citrate, 1 part of the citrate solution being mixed with 9 parts of the blood. The blood was at once divided into the appropriate number of specimens and stored at from 2° to 5° C. Hemoglobin was converted into acid hematin and estimated by the method of Newcomer. The oxygen capacity was measured by the method of Van Slyke and Neill. Since the changes that occur during the first thirty days are the most important, this period has been investigated more closely. All the results show that during that period the tendency for the hemoglobin and oxygen capacity to fall is practically nil. Later, however, the tendency becomes appreciable.

In conclusion, the authors state that neither the hemoglobin content nor the oxygen capacity of the blood is impaired to an important extent by storage under the conditions described for periods up to thirty days.

HENRY F. TITCHEL, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Gray, H. K., and Chauncey, L. R. Pre-Operative and Postoperative Care and Postoperative Complications in Gastric Surgery. *Surg Clin North Am*, 1940, 20: 989

The pre-operative care of patients undergoing gastric surgical treatment must be considered as an individual problem. For a large group of patients, little or no pre-operative care is necessary. Such patients may seek surgical relief of inflammatory processes of the stomach or duodenum that have not responded to medical management. Pre-operative gastric retention is not a problem and these patients are not suffering from marked undernutrition. The surgeon may be assured of the presence of adequate renal function by such simple tests as estimation of the blood urea, routine urinalysis with particular attention to specific gravity, and estimation of the amount of urine voided daily. Simple inquiry as to tolerance of exercise will inform the surgeon of the function of the cardiovascular system. In such a situation no prolonged pre-operative care is necessary.

A second group of patients, however, presents a different problem, a problem arising from the effect of obstruction at the outlet of the stomach, referable to organic lesions, neoplastic or inflammatory, or to spasm. Careful consideration must be given to the resultant undernutrition, depletion of the vitamin stores of the body, the presence of extrarenal azotemia, and secondary anemia, as well as to local phenomena such as the presence of gastric dilatation. These problems must be considered from two aspects: first, the specific complication and, second, the resultant general effect on the patient.

The length of time involved in pre-operative treatment obviously must vary with the individual patient. The presence of malignancy does not permit of too great delay, and a few days' or a week's treatment is all that should be permitted in spite of marked retention. When benign lesions are present, however, the optimal time should be chosen.

The principles involved in postoperative care may be divided into those generally applicable to surgical patients and those relative to gastric surgery in particular. Of prime interest postoperatively is the prevention of shock and postoperative pulmonary complications. During the first twenty-four hours after operation the patient is kept in a modified Trendelenburg position. After this period the shock blocks are removed and the patient assumes a low semi-Fowler position. All patients receive a mixture of 5 per cent carbon dioxide and 95 per cent oxygen by inhalation, administered every hour for approximately three minutes. When it appears that patients respond well to verbal encouragement to

breathe deeply, the carbon dioxide is discontinued. All patients who are to undergo a gastro-intestinal operation have the stomach lavaged in the morning before the operation. Following the operation, the indications for aspirating the contents of the stomach vary according to the different surgical procedures that have been performed. Patients for whom gastric resection has been carried out do not have aspiration of the stomach contents unless some indication is present. Such indications are the presence of hiccough, any amount of emesis, a vague but definite sensation of fullness, or an increasing pulse rate.

For some years a similar routine was also followed in cases in which gastro-enterostomy had been performed. However, recently, patients who have undergone gastro-enterostomy are subjected to aspiration of the gastric contents twice daily post-operatively until the amount of secretion obtainable is less than 100 c cm.

One of the primary essentials in the administration of parenteral fluids is that some method of charting be adopted, so that an accurate balance of fluid intake and output is readily available. The arbitrary principle has been adopted that fluid intake for an average adult must exceed the measurable fluid output by 1,000 c cm daily, and that enough fluid must be given to insure excretion of at least 1,000 c cm of urine daily. Generally, from 2,000 to 3,000 c cm are sufficient for the average patient. Fluid for parenteral administration may be given via different routes.

The usual patient for whom surgical procedures on the stomach have been carried out, if this patient is one in whom little or no retention is present, may receive fluid orally forty-eight hours after operation. Supplementary parenteral administration of fluids should be continued until the patient is able to take 2 liters of fluid orally per day.

The average patient who has undergone a gastro-intestinal surgical operation tolerates mild laxatives very well. Routine orders for enemas never should be permitted. If an undue quantity of barium is found in the colon at the time of operation, the early and frequent use of oil retention enemas will be appreciated by the patient.

Mayo, C. W. Malignant Disease of the Colon, Pre-Operative Preparation and Postoperative Care. *Surg Clin North Am*, 1940, 20: 1033

Those who have had a particular interest in surgical lesions of the colon are agreed that one of the great advances in that field of surgery and its results have been due not to more skilled surgical technique, but to the application of advancing knowledge in the many allied fields of medicine.

The wise surgeon recognizes the great importance of detail, not only in all that is concerned with the

surgical operation itself, but also with all that has led up to it and all that follows it. Some detail, attended to or neglected in any phase of the care of the surgical patient, may decide his fate no one phase pre-operative, operative or postoperative is all-important.

Pre-operative preparation begins when the diagnosis of surgical malignancy of the colon is established. Each individual presents not only a physical problem, but also a mental one, and much of the initial preparation of the patient for operation is of mental nature. An attitude of confidence must be instilled into the patient's confidence in the surgeon, confidence that everything will come out all right, and that he or she will live. Physical conditioning can be divided into two parts: one is concerned with the patient as a whole, to prepare the body to tolerate the necessary surgical procedure by mobilizing the defense troops available in the body and by supplying them from other sources when such additional support may be necessary or helpful. The second part is concerned with the cleansing of the colon for the purpose of lowering the risk of soiling it at the time of operation and to facilitate the necessary technical procedures during the operation. Roughly the total time necessary to get a patient in condition for operation is three or four days.

Rest is very necessary as a measure for general conditioning and proper sedation should be given when necessary.

Unless the colon is obstructed or the growth in the colon has caused a perforation of sufficient degree to contraindicate the oral administration of food, the diet is given by mouth, otherwise field glucose and saline solution are supplied intravenously. The term applied to this diet is pre-operative residue-free. It consists of dextrin added to strained fruit juice with meals, fruit juice between meals, three times daily; hard candy; one slice of Mielba toast, cream of wheat, rice, macaroni, spaghetti, jelly, butter and coffee or tea. These essentials of the diet are arranged in proportions and individual amounts to suit each case.

It has been shown that anemia is a surgical hazard. Time for pre-operative preparation is too short to resort to measures short of transfusion; sometimes multiple transfusions may be necessary.

The value of the use of intraperitoneal vaccine is a controversial point. The thoracic rule is that intraperitoneal vaccination is indicated in cases in which intraperitoneal resection has any chance of being the operation of choice after the abdomen is opened.

The difficulties to be encountered in cleansing the colon will be dependent not only on the amount of obstruction present, but also on the cooperation of each patient concerned. The degree of justifiable effort involved in each case will depend on the amount of obstruction present, on its duration, on the presence or absence of barium proximal to the lesion, as well as on the tendency toward or presence of perforation of the colon.

When marked obstruction exists in the colon, the value or harm of the extended use of intubation will be dependent on the competency or incompetency of the ileocecal valve. The warning against the prolonged use of medical intestinal decompression is the presence of obstruction of the large bowel cannot be too strongly stressed.

When an unusual major surgical procedure has been performed on the colon, regardless of the immediate postoperative condition of the patient, on the other hand, service a transfusion of at least 500 c.c.m. of blood is a routine order. In all cases of major surgery of the colon, another routine post-operative order is that of giving concentrated oxygen.

To the surgeon, the worry is excited. His cases of malignant lesions of the colon begin with the problems of diagnosis and ends, not with death or cure, but with the understanding of the causes of death or of cure, and as a result, the accomplishment of a greater and greater percentage of cures.

Boothby W. M., Mayo C. W. and Lovelace R. W.
II. The Use of Oxygen and Oxygen-Infusion,
with Special Reference to Surgery. *Surg. Clin. North Am.* 9:40, 50 57

The rapidity with which new therapeutic uses for oxygen and mixtures of oxygen and helium have increased is well illustrated by the fact that during 1935 oxygen was administered to approximately 350 patients at the Mayo Clinic, and during 1936 to approximately 500. This increase in the use of oxygen has been the result of the proper application of physiological investigations of respiration and circulation as well as of advances in methods of administration.

As recently emphasized by one of us (C.W.M.), oxygen is given most commonly as a last resort in an effort to prevent death from anoxemia, but there is also a large group of cases in which the administration of oxygen if started early as prophylactic measure will result in elevation of the resistance and diminution of complications. With a consequent shortening of convalescence, a patient who has received high concentration of oxygen following extensive major surgical procedures by means of the B.L.B. oxygen-inhalation apparatus has been affected adversely and for many patients such therapy has been a vital factor in an uninterrupted convalescence.

The early signs of lack of oxygen are an elevation in the pulse rate, cyanosis and usually, a slight increase in pulmonary ventilation. This slight increase in ventilation usually is brought about by a slight increase in the number of breaths per minute with a smaller increase in depth of respiration. Many individuals may become unconscious as a result of anoxemia without sufficient increase of the pulmonary ventilation to attract the attention of the observer. Excess of carbon dioxide, however, causes marked increase in the depth of respiration as well as in the rate of respiration; the dyspnea so caused is very noticeable.

The effects of lack of oxygen in disease are similar to its effects at high altitudes such as can be reached on high mountains or in modern airplanes. This is a vital problem in the case of pilots of airplanes because even slightly impaired mental and physical function may result in an error in judgment or delay in action that may eventuate in an accident.

In the presence of intestinal obstruction every effort should be made to relieve the gaseous distention and, if possible, to overcome the obstruction before surgical procedures are instituted. Approximately 70 per cent of the gas in the intestine is nitrogen. Whenever 100 per cent oxygen is inspired, the partial pressure of nitrogen in the lungs is reduced quickly to practically zero, from the normal partial pressure of 570 mm of mercury. As a result the nitrogen in the plasma of the blood diffuses into the alveoli and is then expired. The combination of oxygen and suction has been used in more than 100 cases and has been beneficial in the greater majority as evidenced by relief of distention, nausea, restlessness, decrease in the pulse rate, and concomitant easier respiration. In successful cases a beneficial effect is obtained within from twelve to twenty-four hours.

Burford and Leigh during the past two years have employed oxygen inhalation routinely during spinal anesthesia. None of the patients on the surgical service of one of us (C W M) during the same period has had headaches after extensive operations on the colon or small bowel under spinal anesthesia if he has been given 100 per cent oxygen for from eighteen to thirty six hours after operation.

Nearly all methods of combating shock that are of proved clinical value are aimed at improving the circulation of the blood and increasing the partial pressure of oxygen in the tissues, especially in the central nervous system. The authors contend, on the basis of frequent clinical observations during the past two years, that the inhalation of 100 per cent oxygen will aid materially each of these well tried methods in attaining its physiological purpose. Every method available should be used in the severe cases, in the milder cases 100 per cent oxygen alone may be sufficient to bring the patient out of shock, especially if administration is started early.

The highest incidence of pulmonary complications occurs after operations in the upper part of the abdomen. Such operations are usually major ones that take some time to perform and subsequently require a comparatively long convalescence. Postoperative atelectasis, infarction, and pneumonia may go on to pulmonary abscess. The treatment of shock associated with pulmonary embolism is the same as that for surgical and traumatic shock. The administration of 100 per cent oxygen is imperative in severe cases in an effort to overcome the anoxemia and break up the vicious circle associated with shock.

As soon as a diagnosis of postoperative pneumonia is made, oxygen therapy should be started at a sufficiently high concentration to control the cyanosis and pulse rate.

Because of the relatively increased consumption of oxygen in cases of hyperthyroidism, anoxemia may develop easily and rapidly and tends to lead to serious consequences. When temperature, pulse rate, and oxygen consumption rise postoperatively, the administration of pure oxygen may prevent cardiovascular collapse.

The administration of high concentrations of oxygen has been found valuable, among other conditions, after operations on the thorax or lungs when there is a resultant decrease in vital capacity and often more or less pulmonary congestion, in the presence of traumatic injuries to the thorax after operations on diabetics (especially on patients in the older age group among whom wounds are likely to heal slowly and infections develop), in the presence of extensive trauma of any type, after reduction of an intussuscepted portion of the bowel, and in carbon-monoxide and cyanide poisoning. The therapeutic uses of helium and oxygen mixtures and of oxygen in various types of surgical cases and problems associated with the administration of both oxygen and helium and oxygen are considered in detail. Reference is also made to the need of oxygen at high altitudes and its use in aviation.

In the past two years, by means of our apparatus for the inhalation of oxygen, the authors have administered 100 per cent oxygen to more than 1,800 patients without observing the slightest evidence of pulmonary irritation. Only a few have been given 100 per cent oxygen continuously for more than forty-eight hours, but this high concentration of oxygen has been administered intermittently for several days. They recommend that this length of time be not exceeded and that thereafter the flow of oxygen be so regulated that the patient receives from 50 to 75 per cent oxygen.

Agular Alvarez, J. Transpleural Routes of Approach (Vías de acceso transpleurales) *Analecta med.*, 1940, 1 3

The author presents a series of illustrations to demonstrate the technique of transpleural approach to the organs located under the left half of the diaphragm, such as the upper third of the stomach, the extremity of the esophagus, the spleen, and the splenic flexure of the colon, which are not sufficiently accessible through the usual incisions. The position of the patient must be such as to afford the greatest facilities to the surgeon.

The site of election at which the incision is to be made is the axis of the ninth rib from the posterior axillary line to the external border of the left rectus muscle and even to the middle line or part of the right rectus muscle. In some cases it will be necessary to resect a portion of the ninth rib or to section adequately the costal cartilages, but in all cases a basic step in the operation is to close off the thoracic cavity by running two parallel lines of sutures through the pleura and diaphragm. The incision to reach the peritoneum is made between these two lines.

Various other incisions have been recommended, such as that starting along the cartilaginous junction of the ribs, running down the lower costal border until it has crossed the mammillary line and then turning upward at right angle, in this case, the cartilaginous junctions of the eighth, ninth, and tenth ribs anteriorly, and the ninth and tenth ribs posteriorly are sectioned to provide the necessary room. Another incision is that of Kirschner, thoracotomy which starts from the middle supra-umbilical line in its upper third, approaches the costal border perpendicularly and follows the seventh intercostal space; the cartilage is then sectioned and the diaphragm opened radially; this gives access to both thoracic and abdominal cavities for mixed cases but the procedure has a serious prognosis. Kirschner recommends also the same incision for cases in which it is desired to keep the intervention below the pleural sac. After the operation, the various planes that have been sectioned are carefully reconstructed.

The transpleural route is very useful in disorders of the upper third of the stomach and high ulcers of the smaller curvature in the treatment of cancer which requires total gastrectomy. In diseases of the cardia or of the last portion of the esophagus, in splenectomy, the fixed esophagus or in traumatic lesions of this organ which require rapid and sure intervention, such as rupture and wound with severe hemorrhage, and in ulcerating stenosing processes of the splenic flexure of the colon which do not require colectomy. **RICHARD KERRY, M.D.**

Wood, C. O. Mason, M. F. and Bialock, A. Studies on the Effects of the Inhalation of a High Concentration of Oxygen in Experimental Shock. *Surgery* 94:3, 247

The effects of the administration of pure oxygen to dogs with mild peripheral circulatory failure produced by hemorrhage, trauma, and the injection of histamine have been studied.

The inhalation of oxygen, under these conditions, results in a considerable increase in the amount of oxygen available to the tissues, as evidenced by rise in the arterial oxygen content and increase in the venous oxygen content of the blood from various parts of the body. This availability may be further enhanced by concomitant increases in carbon dioxide tension.

The observations confirm the prevailing impression that inhalation of high concentrations of oxygen exert beneficial effects in the treatment of peripheral circulatory failure. **SAMUEL KERRY, M.D.**

Well, P. G., Ross, B., and Browne, J. S. L. The Reduction of Mortality from Experimental Traumatic Shock with Adrenal Cortical Substances. *Canad. ex. M. Ass. J.* 91:3, 43

The rôle of the adrenal cortex in the protective mechanism of the organism against variety of damaging stimuli and noxious agents has been shown by numerous investigators. It has been sug-

gested that since the signs and symptoms of traumatic shock resemble those of adrenal insufficiency they are possibly due to failure of adrenal cortical function. In human traumatic shock adrenal cortical extract has been recommended as a valuable aid. However it is difficult to evaluate the reports of its use because of unsatisfactory conditions of treatment and control. The occurrence of shock is unpredictable in patients, operative procedures, and anesthetics vary and cortical extracts have usually been used in conjunction with other therapeutic agents.

The authors studied the effects of administration of adrenal cortical extract and deoxycorticosterone acetate (D.C.A.) without other therapy in the prevention of death in rabbits exposed to a lethal shockling stimulus. The experiments are controlled and of animals were used. Both D.C.A. and cortical extracts were given in divided doses before and after the trauma. The results are divided into two series, one receiving cortin and D.C.A. combined, and the other receiving D.C.A. alone. The mortality in the control animals was 6 per cent, in those treated with D.C.A. alone 46 per cent and in the series treated with both cortin and D.C.A., 19 per cent. The animals given D.C.A. alone had treatment only before trauma and a dose at the time of injury whereas those given D.C.A. plus cortin were treated up to six hours after the injury as well. The average survival time was eight hours in the controls and fifteen hours in the group treated with both D.C.A. and cortin.

Evidence of increased adrenal cortical activity following damage to the organism has been reported. These experiments tend to show that if this increased function is anticipated and augmented by the injection of substances having adrenal cortical activity the mortality from shock after intestinal manipulation is considerably reduced. The administration of adrenal cortical substances before and after operation and in conditions of damage, such as infections, burns, and trauma, may be of clinical importance. **JOHN L. LANGEHART, M.D.**

Magladery, J. W., Solandt, D. Y. and Best, C. H. Serum and Plasma in the Treatment of Hemorrhage in Experimental Animals. *Brit. M. J.* 91:3, 243

In the treatment of posthemorrhagic shock produced in experimental animals, approximately 40 per cent of the blood removed must be restored to secure recovery. Comparable volumes of serum or plasma produce equally satisfactory results. These findings indicate that under these conditions the volume of the red cells restored to the animal is more important than their oxygen carrying capacity, and that serum and plasma, which can be stored for long periods, are effective substitutes for the treatment of hemorrhage.

The results indicate the importance of administering blood or blood substitutes at a rapid rate (from 5 to 100 c.c.m. per min.) and as soon as possible after the hemorrhage. **SAMUEL KERRY, M.D.**

positive response as obtained in 3 of the 4 patients in whom a diagnosis of venous thrombosis of the extremities was made in 2 of the patient of this last group, the thrombotic process engrafted, with marked change in the Westergren reading and beginning morbidity. This last group is especially interesting as it suggests the possibility of diagnostic aid in the recognition of deep-lying venous thromboses.

The remaining 25 cases comprised the group of circulatory accident to the brain (apoplexia cerebri). They are classified as embolic (3 cases) thrombotic (4 cases) and cerebral hemorrhage (7 cases). Only about half the embolic cases exhibited acceleration, and this of moderate degree only. On the other hand only 1 of the thrombotic cases had normal readings. Therefore these two groups like the circulatory disturbance of the extremity depicted the distinction between transient episodes of vascular spasm and the more enduring thrombotic effects.

The remaining case reports, with the exception of 6 in which cases the cause of the cerebral disturbance could not be determined, had to do with the manifestations of cerebral hemorrhage or hemorrhagic sequelae. The majority of patients, in whom the symptoms were milder and soon disappeared without sequelae, evidenced normal readings. In the other groups with progressively severe symptomatology and sequelae in which not only extravasation of blood, but also some destruction of tissue (necrosis) might be expected, the Westergren test responded with an acceleration which was more precocious and more intense presumably as the circulatory insult was increased. In instance the patient entered the hospital with minimal symptoms of cerebral hemorrhage, with little effect on the sedimentation rate, but five days later he suffered severe cerebral attack the sedimentation readings this time reaching high values. In every patient who survived, however, the values began to recede after a month or so so that even in the severe, curable cases with subsequent permanent invalidism, the reaction year or so later was always normal.

JOHN W. BURNHAM, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Cohen, S. M. Experience in the Treatment of War Burns. *Brit M J* 1919, 1

Burns are one of the most important of all rapid casualty injuries. From this author's experience after treating 7 cases of burns, one lesson has stood out clearly—the necessity for and also of prepared routine of treatment. Instructions should be clear and definite because the after-care of these patients must be left to the nursing staff. In the majority of cases both hands are burned and the eyes are closed and it is mistake to fill with burn cases only because the demand on the nursing staff is too heavy. The responsibility of these cases

should be in the hands of the surgeon. He should guide the treatment and often avail himself of the aid of other specialists, as ophthalmologists and dermatologists.

The soldier is "fit" painless, but often by the time treatment is started these patients are exhausted. Sleep and rest are as important as operation. A routine morphine large doses, 1 gr. should be given immediately and often be necessary. The treatment of large number of casualties at once is as difficult to judge how ill burn patient was blood pressure readings and frequent hemoglobin determinations are not practical. Clinical signs alone had to serve as guide to the condition of the patient, and of these the pulse the most reliable. Only cases as it possible to give plasma transfusion. For those patients who are cold, hot water bottles in large numbers used, or hot strong coffee per rectum proved satisfactory.

Most of these burn cases had an immediate application of tannic acid either in solution or jelly and this is unquestionably the method of choice. Every patient was cleaned in the theater as soon as his condition permitted. Many surgeons are reluctant to loan burns admitted late, but the general condition in no way deteriorated with this cleaning nor did the cleaning precipitate severe sepsis or septicemia. All of these patients had received their burns at least twenty-four hours before admission and the majority three or four days previously. A case as too late for full treatment. Fortunately in the majority of these cases the burns are not deep.

Intravenous anesthesia as used to spare the patient the unpleasantness and difficulties of intubation. It is necessary to continue this gas in most cases, and the mask as applied over several layers of sterile gauze.

With arms, face and chest all burned, the work of cleaning may be expedited by nurse or second doctor cleaning at the same time. The importance of gentleness in cleaning such cases is obvious. Weak ether soap solution is used in all these cases and this method of washing—not scrubbing—will merely remove the debris and add nothing to the damage. The region surrounding the burns is washed and prepared as if for operation. In all face and forehead burns the hair should be shaved under the anesthetic. The debris, the dead skin, and all verily blisters are removed.

An immediate tan is undoubtedly of great value and after the cleaning, the solutions 5 per cent tannic acid and 1 per cent silver nitrate are kept separate and are dabbed on the cleaned area by separate gauze sponges. On the face little petroleum jelly is first applied to the eyelids, and if no pieces of wool are held firmly over them, there is no danger of the solution running into the eyes. It has been said that there is some danger of tannic acid causing gangrene of the fingers, but in the cases in this series in which the tips of some fingers touched the

gangrene was primarily due to the burn and was anticipated at the time of the primary treatment.

As a routine the burned hands and forearms were splinted with a padded wire splint with a pad of wool for the palm and gauze between the fingers. In bed, the raising of the splinted arms on a sloping pillow greatly assisted in the reduction of the local edema. This maintains the wound at rest, it is so often forgotten that burns are wounds and must be treated as such. The face and neck should not be bandaged, but sterile towels should be placed under the head and chin. The edges of the burn were painted daily with 1 per cent brilliant green to avoid infection.

The eyes require much care. The excessive secretion is wiped away several times a day, and a few drops of sterile liquid paraffin are inserted. Only 1 patient developed a small corneal ulcer.

Chemotherapy was employed as a routine. Sulfanilamide was given every four hours for ninety-six hours—a total of 19.5 gm. By this method inadvertent overdosage was avoided. With this sulfanilamide dosage there were no complications.

A high protein and high vitamin diet is important. Much protein has been lost via the serum, and milk supplies protein in the most abundant manner.

The above instructions were summarized for each ward in a brief, concise manner.

The limbs are maintained splinted for a week when the scabs will have begun to lift. If healing has been maintained the bands and fingers come out of the splint, a sterile dressing is lightly applied over the tan and active movements are started.

In deeper burns granulation tissue is inevitable, and there will be pus under the tan, but this is no indication for its removal. No further dressing was done in these cases until the fourteenth day when the tan if already lifted was removed. Gauze with vaseline is applied and left another fourteen days. For deep burns it cannot be too strongly emphasized that to prevent scarring contractures skin grafting at the earliest possible moment after the sloughs have separated is advisable. Tight splints will not prevent contractures, often they favor them.

The use of plaster for the limb in an early burn was considered, but the extensive edema so characteristic of burns obviously limits its employment. In the later treatment of the deeper severe burn cases the plaster proved of great value, it was applied fourteen days after the burn. Over a vaseline dressing and one layer of sterile plaster wool the forearms and hands were encased in plaster. The improvement was immediate, and all patients were comfortable. The plasters were changed at fourteen day intervals. In those unhealed at the end of six weeks, skin grafting was immediately done after removal of the pus soaked plaster.

In this series of 70 burns, there were no deaths in 37 cases treated as outlined and only 2 deaths in the 33 cases which had been cleaned and treated before admission by either methyl violet or tannic solution.

HURVEL S. ALLEN, M.D.

Hodgson, A. R., and McKee, G. K. The Surgical Treatment of Air-Raid Casualties. A Review of 12 Cases. *Brit. M. J.*, 1940, 2, 147.

This report is given in a preliminary stage because of several important points brought out regarding the initial treatment of air-raid casualties. Twelve cases are reviewed which were dealt with by one team, consisting of 2 surgeons, 2 anesthetists, 1 sister, and 3 nurses. The injuries were caused by high explosive bombs and many of them were multiple, there being 6 compound fractures. All but 3 of the conditions were severe. Head, chest, and abdominal wounds are not included. There were no deaths and only 1 amputation. The time consumed in the performance of all the operations was four hours, an average of forty minutes for each one. With further organization this period could, no doubt, be shortened. Two tables were used in the same theater.

A separate history of each case is given in some detail, and these histories are followed by a short discussion of problems and innovations in wound treatment. The routine followed in these cases is summarized as follows.

Shock. The patients were put to bed with hot-water bottles and blankets, and the foot of the bed was raised, morphine (if not already administered) and 2,000 units of tetanus antitoxic serum were given. One of the surgeons then went the rounds of the ward, making a list of cases for operation. He saw that patients with tourniquets were dealt with fairly quickly and that patients in the extreme stages of shock were left until they recovered. Patients with severe injuries and a moderate degree of shock were operated on as soon as possible. As there were many in this last category the time element was important. Plasma transfusions were given in the cases of the more severely shocked patients.

Operation. All patients received a general anesthetic, ether being given by the open method. The clothing of each patient was cut off and the wound exposed, a sterile swab was placed over the wound itself and the surrounding skin was then cleansed with ether soap, and shaved. The surgeon now scrubbed up, removed any gross contamination from the wound with forceps, and applied first to the wound and then to the surrounding skin a solution of 50 per cent dettol in spirit, colored with methylene blue. The skin edges, and all of the deeper structures that were colored blue and were readily accessible were excised. Deep perforating tracks, which could not be opened up because of the danger of further injury to important structures, were carefully explored for pieces of bomb casing, the whole wound, and especially these tracks, were then packed with sulfanilamide powder.

After-treatment. Upon returning the patient to the ward the treatment for shock was continued. Sulfanilamide was given by mouth (15 gr. every four hours) as soon as the patient could take it, and was continued for from twenty-four to forty-eight hours, according to the temperature chart. Wound dress-

ing was voided as far as possible, the main indication for inspection of the wound being a slight rise in temperature accompanied by a rapid rise in pulse rate. A musty smell from the dressing is a differential factor which should arouse suspicion of anaerobic infection.

SAUNDERS, H. KLEIN, M. D.

Walters, W., and Magath, T. B. Operative and Postoperative Infections, with Special Reference to Air Borne Bacterial Contamination. *Ann Surg* 1940, 57.

The fundamental principles underlying the application of bacteriology to surgery were early recognized as basic. Refinements and modernization keep these principles constantly before the operating room personnel and tend to make for more accurate and more careful operative technique in the performance of the necessary surgical procedure with a minimum of trauma and without undue prolongation of the operation.

The contamination of wounds may result by the direct introduction of air-borne bacteria into the wound. It is obvious that the condition of the wound will have a profound effect on the development of these contaminating agents. Tissues from which the blood supply has been cut off or which have been devitalized by trauma offer an excellent medium for the development of bacteria. Live, normal tissue is by nature resistant. For this reason pieces of tissue which are cut off from a blood supply should be removed. If air spaces are present in wounds, either horizontally or vertically they offer opportunity for the accumulation of serum and exudates which furnish an excellent bacterial medium. Wounds which are dry usually do not permit the development of bacteria as rapidly as wounds which are wet hence, oozing should always be thoroughly controlled.

Aside from these items, which are entirely in the hands of the surgeon, there is another group of important sources of contamination. Meleny, in reporting a nine-year study of infection in clean operative wounds, listed the possible sources of contamination in the following order: (1) the nose and throat of the operating personnel; (2) the hands of the operating personnel; (3) the skin of the patient; (4) the air of the operating room; and (5) the instruments and materials used in the operation.

In 1933 Walker, in studying the incidence of hemolytic streptococcus infections, was convinced that direct contamination of the wounds occurred from the nose and throat of the operating personnel. Hart and Schiebel believe that there is definite correlation between the type and number of organisms found in the air of a given room and in the noses and throats of a group of regular occupants of that room. These authors said that "the number and type of colonies cultured from material taken from the nose and throat seem to parallel more nearly the number and type of colonies cultured from sediment from the air."

Devenish and Miles, who studied various sources of contamination of wounds by the staphylococcus

surens, placed great emphasis on the rôle played in direct contamination of the wound through perforations in punctured rubber gloves. These observers found that the incidence of puncture in 65 gloves patched and unpatched gloves was 24 per cent, while in a second and third series of tests of unpatched gloves worn by surgeons, chief assistants and instrument nurses 14.5 per cent were found to be punctured.

By no process yet known is it possible to sterilize the skin of the patient completely throughout the layers which are cut by the surgeon's knife. The antiseptic should kill bacteria in reasonably short time, it should not be neutralized by the presence of small amounts of serum, fats, soaps or oils and its effect should last at least throughout the operation and preferably for several hours after the closure of the wound. It should not be an irritant to the skin. After many experiments it was decided that the antiseptic which most nearly fulfills the requirements at the present time is tincture of mercuric iodine.

In 1933 Dandy called attention to the importance of more adequate sterilization in hospitals. Unless tests are made at frequent intervals to determine the efficacy of the method of sterilization used for autoclaved materials, such materials offer a possible source of wound infection.

Since attention has recently been given to air conditioning it is not peculiar that attention should be directed to the possibility of air-borne infection in the operating room. Sufficient evidence has been brought forward to indicate that the bacteria in the nose and throat of the operating team and of the gallery have distinct possibilities in regard to the infection of wounds. It is obligatory upon the individuals to cover the oral and nasal orifices with adequate masks. The operating room should be stripped of all unnecessary equipment and it should be kept scrupulously clean. Bacteria settle from the upper to lower strata and eventually to the floor. Bacteria which originate in the nose and throat are not often found above the six-foot level and they filter down to the floor. In order to prevent the falling bacteria, which originate in the gallery from reaching the operating room some surgeons have had canopies built over the operating table. The others have for years had canopies built over the instrument tables, and test plates placed on top of and under the canopy clearly reveal the fact that the canopy offers an enormous protection to the instruments. Tests which the authors have performed with the ultraviolet light have indicated that, unless the bacteria are exposed for long periods of time, at close range to the light, and then without any coating of serum, gelatin, or agar there is little or no killing to be demonstrated. More or less dry bacteria, exposed in confined regions, are readily killed.

There is no doubt that the bacterial content of the air in an operating room increases with time and the number of persons present, yet no special correlation can be demonstrated between the number of infections and the order of operations performed in any

given room. Even yet the exact source of these bacteria or their significance in regard to wound infection is not known. It is evident, however, that direct introduction of bacteria into a wound from a non sterile instrument or material, the excretions from noses and mouths of the persons close to the wound, or sweat from the hands of the operating team through punctures of gloves, is of tremendous significance and an effort should be made first to correct these conditions before turning to the sterilizing of the air of the room. If some effort is indicated in this regard a system of air filtration should be tried, but one may not expect to reduce operating-room infections greatly until after the first enumerated sources of infection are controlled.

Piror, W. M. The Intrathecal Administration of Tetanus Antitoxin. *Arch Surg*, 1940, 41: 209

The author has attempted to evaluate the relative value of the intrathecal and the intravenous administration of antitoxin in the treatment of general tetanus.

Healthy dogs were given approximately two lethal doses of tetanus toxin filtrate intravenously. Fifty-three hours later the animals were divided into groups according to the severity of their symptoms and were given 680 American units of tetanus antitoxin per kilogram, either intravenously or intracisternally.

Intracisternal administration of the antitoxin gave better results than intravenous administration in dogs that were suffering from early, mild, or moderately severe tetanus. In dogs with severe tetanus this difference was of a smaller degree.

Among 70 dogs that received the antitoxin by the intracisternal route the mortality was 27 per cent, among 30 dogs that were treated by lumbar injection the mortality was 37 per cent, and in 20 dogs that were given antitoxin intravenously and horse serum intracisternally the mortality was 45 per cent. Among 65 animals that received only intravenous injections of the antitoxin the mortality was 75 per cent. All control animals that received no treatment with antitoxin died from tetanus.

Although these figures alone do not warrant the use of intracisternal injection for patients, they furnish conclusive evidence that the mortality among dogs with general tetanus is lowest when the antitoxin is given by the intracisternal method.

EDWARD W. GIBBS, M.D.

Chalm, F., Florey, H. W., Gardner, A. D., Heatley, N. G., and Others. Penicillin as a Chemotherapeutic Agent. *Lancet*, 1940, 230: 2-6

It has been noted by Fleming that a mold produced a substance which inhibited the growth in particular, of the staphylococcus, streptococcus gonococcus, meningococcus, and corynebacterium diphtheriae, but not of the bacillus coli, haemophilus influenzae, salmonella typhi, bacillus proteus, or vibrio cholerae. A broth containing this substance is called penicillin.

The results of experiments done on mice, rats, and cats are clear-cut, and show that penicillin is active *in vivo* against at least three of the organisms inhibited *in vitro*. It is a reasonable hope that all organisms inhibited in high dilution *in vitro* will also be affected *in vivo*.

Penicillin does not appear to be related to any chemotherapeutic substance now in use, it is particularly remarkable for its activity against the anaerobic organisms associated with gas gangrene.

SAMUEL KIRBY, M.D.

ANESTHESIA

Adams, R. C., and Lundy, J. S. Factors Influencing the Choice of the Anesthetic Agent and Some Suggestions on Anesthetic Technique. *Surg Clin North Am*, 1940, 20: 915

Perhaps the most valuable asset of a thoroughly trained anesthetist is his ability to select anesthetic agents and methods which are most suited to each individual patient. As a result of his judgment, both the surgeon and the patient are benefited.

An anesthetic must be chosen which will have the least deleterious effect on the patient, but which, at the same time, will be adequate for the anticipated operation. Frequently, the choice involves the combination of two or more methods, any one of which used alone would be inadequate.

Among other factors regulating the choice of the anesthetic to be employed are the age of the patient, the degree of debility or toxicity present, the site, nature, and proposed duration of the operation, and the hazard of anesthetic explosion. The emotional stability of the patient is another important factor, this can now be controlled by preliminary medication. Sometimes patients have preferences as to the anesthetic, and if the anesthetic they wish is suitable for them, it is well, if possible, to yield to their wishes in this regard. Intravenous anesthesia has been used to advantage for induction prior and supplementary to inhalation, local, and spinal anesthesia. The patient's muscular development and habits and mode of life all influence the choice and course of the anesthetic to be used. Patients suffering from chronic alcoholism are notorious for tolerating anesthetics poorly.

Each agent and method has advantages and disadvantages among the gaseous anesthetic agents nitrous oxide with oxygen is non explosive and non irritating to the lungs, but it has been found to be inadequate for major surgical procedures. Ethylene although a somewhat more potent agent than nitrous oxide with oxygen, still falls short of being a perfect anesthetic, and it is inflammable in anesthetic concentrations. Cyclopropane, a potent anesthetic agent, is almost non irritating to the lungs and exerts a minimal effect on the chemistry of the blood. It is also explosive in anesthetic concentrations and may produce grave cardiac irregularities. This agent may be dangerous in the hands of the untrained in its use. The potency and toxicity of ethyl

chlorid and divinyl ether inhibit the field of their usefulness in the hands of untrained anesthetists.

Ether remains the safest of the volatile anesthetic agents and the safest inhalation anesthetic agent for general use. Used alone it produces adequate anesthesia for many types of surgical procedures. Despite its outstanding usefulness, ether may produce many deleterious changes in the function of the blood and tissues. It is irritating to the respiratory tract and it may be both inflammable and explosive.

Regional anesthesia could be employed to advantage more often than it is, but occasionally it must be supplemented to advantage by some other method, especially for nervous patients. Spinal anesthesia is contraindicated for patients who are markedly debilitated, especially if the hemoglobin is below 50 per cent. Spinal anesthesia is also contraindicated for some patients who have hypotension or lesions of the spinal cord, and for nervous individuals. Many physicians do not favor spinal anesthesia for extensive operations in the upper portion of the abdomen. Rectal anesthesia is usually safe for purposes of basal narcosis. Intravenous anesthesia has recently attained considerable prominence and its field of usefulness continues to increase. At this time only two agents possess exceptional merit, namely pentothal sodium and evipal sodium. Among the advantages of intravenous anesthesia are the rapidity of induction, the short period of recovery and the fact that postanesthetic complications, especially nausea and vomiting, are rare. Intravenous anesthesia is not always a suitable method for long or extensive operative procedures and there are types of surgical procedures in which it is contraindicated.

In selecting the anesthetic of choice, one of the first things to consider is the type and amount of the agents to be used in preliminary medication. Usual preliminary medication consists of the administration of barbiturate by mouth or rectum, or intravenously and of morphine and atropine by hypodermic injection.

The dosage required to bring about this end varies with the individual, his metabolic rate, age and physical condition, emotional tone, and so forth. The use of morphine is usually contraindicated for a younger child because its respiration is depressed easily even after small doses of the drug.

The site of the operation also is an important factor in choosing the most suitable type of anesthetic to be used. In some fields the choice may be broad, whereas in others, the choice is narrowed to one or two methods. Some of the choices of anesthesia which may be made in the various fields of surgery are given in the complete paper. Certain systemic diseases markedly influence the choice of anesthetic. One of these is diabetes mellitus.

Koontz, A. R., and Shackelford, R. T. The Effects of Ether Anesthesia on Anaphylaxis. *Amer. J. Anat.*, 1919, 9, 96.

The authors carried out a series of experiments on guinea pigs in an attempt to decide whether ether

anesthesia would or would not prevent anaphylactic reactions. After using various methods for producing shocking injections it was finally decided that the best results were obtained by using guinea pigs weighing not less than 650 gm. These are sensitized with .5 c.c.m. of horse serum given subcutaneously and three weeks later .5 c.c.m. of horse serum were injected into the jugular vein to provoke shock. A striking difference in mortality was noted between those animals which had and those which had not been etherized.

From these experiments, it was concluded that ether anesthesia gave great protection against anaphylactic shock in guinea pigs. However, the authors do not feel justified in stating that this protection is absolute.

The evidence as to whether this applies to human beings is not convincing as yet. During the World War it was customary to administer serum to wounded soldiers while under ether anesthesia without the usual precautions against anaphylactic shock. The authors have searched the Surgeon-General's reports and have questioned men in positions of authority at that time and have found no evidence of unfortunate results. Only one could be found in the literature in which there was a fatal anaphylactic reaction while the patient was under ether anesthesia. Nevertheless, it is concluded that the evidence is not yet sufficient to justify the elimination of the sensitivity test before administration of a serum to a patient under anesthesia.

SAWYER H. KIRBY, M.D.

Rivett, L. C., and Quagley, G. A Method of Administering Continuous Intravenous Anesthesia for Abdominal Surgery. *Proc. Roy. Soc. Med. Lond.* 94, 23, 63.

The authors describe an apparatus for the continuous administration of intravenous anesthesia. This consists of two reservoirs, one containing a 5 per cent solution of pentothal and the other a 5 per cent dextrose in normal saline solution, connected to the intravenous needle by a T-tube.

Throughout the course of the operation, saline solution and dextrose are kept dripping to ensure that the needle is always patent. If at any stage of the operation, the patient shows signs of shock the rate of flow can be increased, and, if considered necessary, the apparatus can remain attached to the arm during the patient's return to the ward. In the event of severe hemorrhage, blood could be substituted for the saline solution.

Because of the dilution of the pentothal down to a 5 per cent solution, the amount given can be delicately controlled. From 1 to 2 c.c.m. of this solution are usually required every two to ten minutes.

Rivett has had very large experience with major pelvic operations under intravenous pentothal, without any inhalation anesthetic whatsoever and he can definitely say that there are certain great advantages. Perhaps the first of these is the shallow respiration which accompanies anesthesia with intra-

venous anastomoses—a very great advantage in pelvic surgery, as the intestines gravitate into the upper abdomen when the patient is in the Trendelenburg position, which gives excellent access to the pelvic organs.

He has found that even light anesthesia gives very good relaxation of the abdominal muscles, and if a little deeper anesthesia be required, it is easily and rapidly produced.

It does not appear to be easy for the anesthetist to know with certainty the depth of anesthesia, and at one time, as a routine, he tested the patient's insensibility by pricking with a scalpel. The more experienced the anesthetist, the less necessity there is for this procedure. It is a minor drawback which is overcome with experience. The second drawback is the occasional difficulty the anesthetist experiences in finding a vein and in keeping the needle in the vein when found. The only other drawback the author has ever seen has been due to some of the solution's leaking into the subcutaneous tissues, which caused actual ulceration. Ulcers produced in this way may take longer to heal than the major operation incision itself.

The anesthesia does not seem to be as deep as full surgical ether anesthesia. Therefore, the surgeon must be gentle in all his manipulations. Sudden and violent traction on any organ may produce sufficient stimulus to break through the anesthesia and cause the patient to move. If anything, this is an advantage, as the author is quite convinced that rough handling of the uterus, ovaries, or intestines is a very great factor in producing shock. Rivett is convinced that pentothal is the anesthetic of choice, and that it is the least dangerous of all anesthetics.

SAMUEL H. KLEIN, M.D.

Palma, E. C., Alonso, J., and Pérez-Fontana, M.
Segmental Peridural Anesthesia (Anestesia peridural segmentaria) *Bol. Soc. de ciruj. de Rosario*, 1939, 10: 399.

The authors recall the anatomy of the peridural space and also the experiments on cadavers and on dogs which have shown that the degree of diffusion of liquids injected in this space is inversely related to their viscosity and depends especially on gravity and, therefore, on the position of the patient. They point out that, as the posterior longitudinal venous plexuses occupy a paramedian position and as the posterior transverse venous plexuses are found in front of the vertebral laminae and not at the level of the yellow ligaments in the lumbar and lower dorsal regions, there is no danger of puncturing them when a needle is introduced in the middle line between the vertebrae. It has been established that the pressure in the peridural space is negative, and this fact may be used to determine the penetration of the tip of the needle into that space. The authors have used segmental peridural anesthesia in 64 cases for interventions on the abdomen, the perineum, and the lower extremities. Their technique included the following points:

The original solution used has been gradually improved and the authors now employ a mixture of novocaine (15 per cent) and pantocaine (1 per thousand) in double distilled water. The needle is 12 cm. long, has a short bevel to avoid injury to the dura mater, and is provided with a mandrel having the same bevel as the needle. The needle should have a guard at its posterior end to facilitate its manipulation, and the guard should have a depression which communicates with the lumen of the needle and into which a drop of the anesthetic solution can be deposited to be aspirated into the lumen at the moment the needle penetrates into the peridural space (sign of Gutierrez). The patient is placed in lateral decubitus, or, preferably, is seated, but always with the spine flexed. The site of puncture will depend on the level of the desired anesthesia. Puncture is made between the tenth and twelfth dorsal vertebrae for interventions on the upper abdomen, between the twelfth dorsal and the second lumbar vertebrae for those on the lower abdomen, and between the third and fifth lumbar vertebrae for those on the lower extremities. The patient is given an injection of morphine hydrochloride (0.01 gm.) one hour before the intervention. After previous infiltration of the site and course of the puncture with a 0.5 per cent solution of novocaine, the puncture is made exactly in the median line and the direct procedure is used, the injection being stopped as soon as the yellow ligament has been pierced. Various signs help in deciding when the peridural space is reached: the sensation of unequal resistance, the absence of the issue of cerebrospinal fluid after the yellow ligament has been passed, Doghotti's sign which consists of the difference in pressure needed to inject the solution, the impossibility of aspirating cerebrospinal fluid, Gutierrez' drop sign, Mondadori's sign (an injection of double distilled water in the peridural space causing intense abdominal pain), and the temperature of the backflow drops. If there is a lack of paresthesia or complete anesthesia and paralysis of the lower extremities ten minutes after the injection of 5 c.cm. of the anesthetic solution the needle was not in the subarachnoid space. Great caution is recommended in the administration of the remaining amount of the solution, the pulse and the arterial pressure as well as the general condition of the patient serving as continuous controls, 10 c.cm. are injected slowly every five minutes. This does not cause any loss of time as peridural anesthesia needs from twenty to twenty-five minutes to develop its full effect.

The authors have obtained 54 good anesthetics in 64 injections. In 3 cases, local anesthesia was needed to close the abdominal wound and in 1 case it was necessary to anesthetize the mesentery. In 5 cases, the anesthesia was poor and was completed with ether. Slight disturbances due to anesthesia of the sympathetic occur regularly and are prevented by a simultaneous injection of ephedrine. A tendency toward tachycardia is frequently observed.

The anæsthesia lasts from seventy to one hundred minutes and the postanæsthetic course is excellent.

Peridural anæsthesia is contra-indicated in patients who present local anatomical changes which impede puncture under good conditions and in those with hypotension, shock, marked anemia, and cardiovascular decompensation. It can be used in all surgical conditions of the lower extremities, the perineum, the pelvis, the urinary tract, and the abdomen, in which local anæsthesia cannot be employed.

RICHARD KENNER, M.D.

Peirson, E. L., and Twomey, C. F.: Neurogenic Dysfunction of the Bladder Due to Spinal Anæsthesia. *New England J Med* 940, 37.

Nerve damage resulting from spinal anæsthesia is fortunately a rare complication, but apparently it is much more common than is generally recognized. Of the various sequelæ of spinal anæsthesia which have been reported, paralysis of the bladder appears to be one of the most serious.

It is interesting that the neurological lesions resulting from spinal anæsthesia are extremely varied, both in character and in severity. Looser reports 5 cases of peripheral neuritis affecting isolated peripheral nerves which he had seen in one year. These cases followed the administration of small doses of procaine. Likewise, cases of ocular paralysis lasting several weeks or more have been reported. Smith saw a case of incomplete transverse myelitis following the use of spinocaine. Hyslop reports a case of aseptic meningitis resulting from the administration of 200 mgm. of upercaine. One of the authors

(E.L.P.) has seen a similar case following the administration of 50 mgm. of novocaine. Ferguson and Watkins report 3 cases of injury to the crura equina which they had personally observed, and have also collected 6 other cases from the literature. In these the most striking and most serious symptom was immediate retention of the urine, followed at a later period by incontinence. The patients continued to have residual urine and difficulty in urinating for periods varying from several weeks to more than two years.

The authors report a case of a sixty-year-old man who was entirely well until an appendectomy was performed under spinal anæsthesia. Following this operation he had complete retention of urine for two and one-half months. Since a complete study of the case failed to show any cause for this retention, it was assumed that the bladder dysfunction was due to nerve injury as a result of the spinal anæsthesia. The retention of urine was relieved following presacral nerve resection. This was done after three weeks of preliminary treatment for urinary sepsis by catheter drainage with a small Foley catheter connected so that the drainage system was kept closed. Irrigation as performed about disconnecting or opening the system. The patient has remained well for seven months following his discharge from the hospital.

The literature on this subject is reviewed, and it is suggested that minor degrees of nerve damage are more generally a result of spinal anæsthesia than is usually thought to be the case.

JOHN E. KENNEDY, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Schwartz, C W Cranial Osteomas, From a Roentgenological Viewpoint *Am J Roentgenol*, 1940, 44 188

A group of 48 cases of cranial osteomas was reviewed. Sixty per cent of them were fronto-ethmoidal in origin, half of these originating wholly within the frontal sinuses and half in the vertical portion of the frontal bone. Thirteen per cent originated in the orbito-ethmoidal region and 13 per cent in the parietal bones. Six per cent involved the petrous portions of the temporal bones and 4 per cent the squamous portions of the temporal bones. Four per cent were found in the occipital region.

Usually osteomas arise from the surface of the bone and can be designated as exostotic, but occasionally they originate within the bone and are endostotic. Usually the osteomas of the frontal region and of the facial bones are of the endostotic variety. This is true also of the osteomas which involve the bones of the cranial vault. The calvarial osteomas usually originate in the diploë and involve one or both adjacent tables.

The etiology of osteomas is unknown. Trauma or infection may at times stimulate an osteoma to accelerate its normally slow growth. A year or two may intervene between the trauma and the increase

in size of the tumor. Cranial osteomas are more prevalent in males than in females but this may be due to the greater frequency of examination of the male skull, which is more subject to accidental trauma.

Intracranial and particularly frontal osteomas may be associated with mucocoeles. When such an association occurs, the osteoma may extend intracranially and puncture a lateral ventricle. Surgical removal is the only known way to stop such progress. Osteomas may invade the orbits and when they do there is usually some exophthalmos of a non-pulsating type. Such orbital tumors are chiefly ethmoidal in origin and occasionally pedunculated.

Many cranial osteomas are asymptomatic and this is true particularly of the tumors found in the frontal sinuses. If such an asymptomatic osteoma is discovered, the patient should be examined every six or eight months in order to determine whether there is any increase in size. If an increase in size occurs, the osteoma should be removed. Osteomas are more likely to grow rapidly in young people. The spongy type of tumor will enlarge more rapidly than one composed of dense sclerosing bone.

The author discusses in detail the differential diagnosis. A number of excellent illustrations accompany the article, two of which are here reproduced. Figure 1 illustrates an osteoma of the frontal bone and Figure 2 an osteoma of the petrous portion of the temporal bone. HAROLD C. OCHSNER, M.D.



Fig. 1. An osteoma of the frontal bone. The fronto-ethmoidal region is a common site of election for these tumors.



Fig. 2. An osteoma of the petrous portion of the temporal bone. It is of the combined dense and spongy type.

Swamy H. C. On the Nature of Calcified Lesions; with Reference to Those in the Spleen. *Am J Roentgenol* 940, 44, 200.

A series of 30 tuberculous patients, 16 of whom were adults and 4 children, has been studied to determine the evolution of calcified lesions, principally in the spleen. The ages of the lesions in the lung lymph nodes and spleen corresponded in 6 corresponding lesions were found in the mesentery and spleen in patient, and in the lungs, lymph nodes liver and spleen in but in there was no agreement of ages of the respective lesions.

In his studies the author has found the evidence to be in favor of tuberculosis as the cause of calcifications of the spleen. The lesions are within the parenchyma of the spleen and not in the splenic veins at the periphery or in the trabeculae, where phleboliths are not to appear. Most of the calcifications are multiple and appear to be result of hematogenous dissemination. Many of the lesions in each group of calcification are from two to three times the size of the average veins, and are therefore too large to represent phleboliths. They are associated with and correspond roughly in general characteristics to primary tuberculous lesion elsewhere and would therefore correspond to the hematogenous phase of the primary infection.

The author believes that to insure greater accuracy the roentgenological diagnosis of calcifications in the spleen should be made only on the basis of good stereoradiograms. A similar examination should be made of the chest, neck, and lower abdomen for calcification of the tubercles. The presence of calcified tubercles in the spleen has in itself little clinical significance, but it shows that primary tuberculous and hematogenous dissemination once existed. H. C. Swamy, M.D.

Björre H. Roentgenological Diagnosis of Placenta Previa. *Acta obst et gynec Scand* 940, 20, 47.

In examinations by the cystographic method of Lide and Cruser made toward the end of pregnancy in 30 women patients it was also found that the massive central placenta previa reveals itself by a fairly large constant fissure (exceeding 1 cm) between the head of the fetus and the shadow of the bladder whereas the partial placenta previa can not be diagnosed with certainty by this method.

Free interspaces up to 1 cm. width, are frequently found in normal cases of pregnancy but in these cases it is as possible to eliminate the fissure by photographing the patient in an upright position. This procedure was attended by no unfavorable impression of the fetal head in some cases.

García, Pascual J. and Riala de Pablo, J. Arthrography of the Knee in the Diagnosis of Trauma to the Menisci (La artrografía de rodilla para el diagnóstico de los traumatismos meniscales). *Rev dia. española*, 940, 37.

The diagnosis of trauma to the meniscus is ordinarily made on clinical examination and is sufficient in

most cases in which there is history of trauma, by drawing repeated locking of the joint, joint pain and impossibility of extending the flexed leg. However not all cases are so clear cut, and it would be desirable to have some objective means of locating the site of injury particularly at the present time when sports have become so popular. For accomplishing this purpose either air or opaque substances may be injected into the joint cavity which is then x-rayed.

In 1905 Wernsdorff and Robinson were the first to practice arthroscopy. The method was revived by Birchler in 1920, and since then there have been numerous variations introduced by various authors in Germany, France, and America. The author uses for this purpose Canligian's method employing peribrodil (Merck) 33 per cent solution. This solution causes no pain when injected into the joint and after two hours has disappeared completely from the interior of the joint. No secondary joint reactions have been observed after its use.

The author describes his technique of injection after sterilizing the skin he inserts spinal puncture needle into the knee joint medial to the patellar tendon immediately above the internal tibial condyle. After the needle penetrates the knee for from 3 to 4 cm. the author injects 3 c. cm. of the solution of peribrodil, with the needle about in contact with the tibial plate. After withdrawing the needle flexion and extension of the joint are done about 10 or 14 times and then an anteroposterior x-ray is taken. The anteroposterior view of the joint is found to give the most information, although at times lateral and oblique views are taken. In the normal cases (Fig. 1) the contrast medium is spread uniformly between the joint cartilages and the menisci. In pathological cases the contrast medium fills the meniscal area (Fig. 2) revealing rupture of the external meniscus. The author presents many reproductions and drawings which illustrate the various pathological types usually found. Of 3



Fig. 1.

Fig. 2.



Fig. 1

patients studied, 7 had rupture of the external meniscus. The findings were confirmed by operation.
 Jacob L. Kohn, M.D.

Lewis, R. W. Roentgen Recognition of Synovioma
Am. J. Roentgenol., 1949, 44: 170

The author reports in detail 4 cases diagnosed as synovioma or synovial sarcoma. Roentgenologically they presented a rounded or lobulated sharply

defined shadow of a soft tissue tumor mass near a joint, within which scattered and irregular deposits of amorphous lime were found. He believes the appearance to be sufficiently characteristic to justify a provisional diagnosis. In view of the malignant or potentially malignant nature of the lesion its early recognition is desirable, and the roentgen findings mentioned should serve to render this possible.
 Abram H. Hartsell, M.D.

Sweeney H. C. On the Nature of Calcified Lesions with Reference to Those in the Spleen. *Am J Roentgenol* 9:40 44 1909.

A series of 20 tuberculous patients, 16 of whom were adults and 4 children, has been studied to determine the evolution of calcified lesions, principally in the spleen. The ages of the lesions in the lung, lymph nodes, and spleen corresponded in 6 corresponding lesions were found in the mesentery and spleen in 1 patient, and in the lymph nodes, liver and spleen in 1 but in 1 there was no agreement of ages of the respective lesions.

In his studies the author has found the evidence to be in favor of tuberculosis as the cause of calcifications of the spleen. The lesions are within the parenchyma of the spleen, and not in the splenic veins at the periphery or in the trabeculae, where phleboliths are wont to appear. Most of the calcifications are multiple and appear to be result of hematogenous dissemination. Many of the lesions in each group of calcification are from two to three times the size of the average veins, and are therefore too large to represent phleboliths. They are associated with and correspond roughly in age characteristics to primary tuberculous lesion elsewhere and would therefore correspond to the hematogenous phase of the primary infection.

The author believes that to insure greater accuracy the roentgenological diagnosis of calcifications in the spleen should be made only on the basis of good stereorecentgenograms. A similar examination should be made of the chest, neck, and lower abdomen for calcification of the tubercles. The presence of calcified tubercles in the spleen has in itself little clinical significance but it shows that primary tuberculosis with hematogenous dissemination once existed. HAROLD C. OSMY, JR., M.D.

Bjerre H. Roentgenological Diagnosis of Placenta Previa. *Acta Obst et Gynec Scand* 9:40, 50 47.

In examinations by the cystographic method of Ude and Linder made toward the end of pregnancy in 3 women patients, it was also that the massive central placenta previa reveals itself by a fairly large constant fissure (exceeding 1 cm.) between the head of the fetus and the bottom of the bladder whereas the partial placenta previa cannot be diagnosed with certainty by this method.

Free interspace of 1 to 2 cm. width, rarely frequently found in normal cases of pregnancy but in these cases it is possible to eliminate the fissure by photographing the patient in upright position. This procedure was attended by manual impression of the fetal head in some cases.

Gascó, Pascual J., and Sala de Pablo, J. Arthrography of the Knee in the Diagnosis of Trauma to the Menisci (La artrografía de rodilla para el diagnóstico de los traumas meniscales). *Revista Española* 94 37.

The diagnosis of trauma to meniscus is ordinarily made on clinical examination and is sufficient in

most cases in which there is a history of trauma, by dizarthrosis, repeated locking of the joint, joint pain, and impossibility of extending the flexed leg. However, not all cases are so clear cut, and it could be desirable to have some objective means of locating the site of injury particularly at the present time when sports have become so popular. For accomplishing this purpose either air or opaque substances may be injected into the joint cavity which is then rayed.

In 1905 Wernsdorff and Robinson were the first to practice arthrocentrography. The method was revived by Birchler in 1929, and since then there have been numerous variations introduced by various authors in Germany, France, and America. The author uses for this purpose Canigral's method employing parabrodil (Merrick) 35 per cent solution. This solution causes no pain when injected into the joint and after two hours has disappeared completely from the interior of the joint. No secondary joint reactions have been observed after its use.

The author describes his technique of injection after sterilizing the skin, he inserts a spinal puncture needle into the knee joint medial to the patellar tendon immediately above the internal tibial condyle. After the needle penetrates the knee for from 3 to 4 cm. the author injects 3 c. cm. of the solution of parabrodil, with the needle almost in contact with the tibial spine. After withdrawing the needle flexion and extension of the joint are done about 3 or 4 times and then an anteroposterior x-ray is taken. The anteroposterior view of the joint is found to give the most information, although at times lateral and oblique views are taken. In the normal cases (Fig. 1) the contrast medium is spread uniformly between the joint cartilages and the menisci. In pathological cases the contrast medium fills the meniscal area (Fig. 2) revealing rupture of the external meniscus. The author presents 42 reproductions and drawings which illustrate the various pathological types usually found. Of 3



Fig. 1.

Fig. 2.

ficial, particularly in the cure of the cardiovascular disturbances of beriberi, and in the relief of the muscular pain and weakness which frequently accompany nutritional polyneuritis

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A diabetic patient with diarrhea and ulcerating blisters of the skin was cured by the administration of large doses of Vitamin B and nicotinic acid

PAUL STARR, M D

Crandon, J H, Lund, C C, and Dill, D B Experimental Human Scurvy *New England J Med*, 1940, 223 353

A normal active adult placed himself on a Vitamin C-free diet supplemented by the other known vitamins for a period of six months. The findings in this state of pure Vitamin C deficiency, that is, in the absence of factors such as multiple avitaminoses, infection, growth, or other stress, were as follows

One hundred and thirty-two days of a diet totally deficient in Vitamin C were required for the first abnormal clinical signs—hyperkeratotic papules—to appear, 161 days were necessary for the appearance of the perifollicular hemorrhages of scurvy

The plasma-ascorbic-acid level was zero for thirteen weeks before the first evidence of clinical scurvy was manifest. It is not necessarily, therefore, a good index of the Vitamin C status of the individual

The vitamin level in the white cell-platelet layer of the centrifuged blood was a good index of the Vitamin C status of the subject. This level fell to zero shortly before the appearance of clinical scurvy

Adequate wound healing of an aseptic incision occurred after the plasma-ascorbic-acid had been zero for forty four days and when the white cell-platelet ascorbic acid level was 4 mgm per 100 c cm. This was after the subject had been on the diet for three months

With total Vitamin C deficiency, failure of wound healing occurred in a second incision made after six months on the diet. The tissues under these circumstances showed microscopically a lack of intercellular substance. Parenteral Vitamin C alone brought about good healing, and considerable intercellular substance appeared within ten days

Hyperkeratotic papules containing ingrown hairs appeared over the buttocks and posterior aspects of the legs as a result of Vitamin C deficiency, indeed, they may be the first sign of such a deficiency

There were no gross changes in the gums or teeth (with good pre-existing oral hygiene). Although the mouth was grossly negative, x ray films of the teeth showed interruptions of the lamina dura in early acute scurvy. Such an x ray picture may be one of the better diagnostic criteria in early scurvy

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During a six-month period of total deficiency and after a month of clinical scurvy the blood-complement titer was still normal. Over this period there was no evidence of lowered resistance to infection

The Goethlin, Dalldorf, and Ruempel-Leeds tests were negative, even in the presence of frank scurvy. These tests must, therefore, be poor indices of sub-clinical scurvy, even though they may produce petechiae which are cleared up by ascorbic-acid therapy

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Petri, S, Nørgaard, F, and Bandier, E Studies on the Causation of Experimental Gastroprival Pellagra *Acta med Scand*, 1940, 104 245

The studies published in 1938 and 1940 by Petri and his associates demonstrated that the parenteral administration of nicotinic acid had no effect on experimental pellagra after gastrectomy. In this article this observation has been extended with a similar conclusion with regard to parenterally administered Vitamin B₁, riboflavin, and Vitamin A. The experiments were carried out in gastrectomized swine. Pathological changes in the blood count, adrenal and thyroid glands, bone marrow, and central nervous system were found. The parenteral route of administration excludes change in intestinal absorption as an explanation of the negative results

Considering the interaction and transitions that may be observed between pellagra, beri beri, and alcoholic polyneuritis, clinically as well as experimentally, the thought naturally suggests itself that perhaps there may be some gastrogenous etiological connection between the three lesions. The administration of human stomach juice, or dried swine stomach (ventriculin) plus hydrochloric acid has proved beneficial to patients suffering from pellagra and alcoholic polyneuritis in those instances in which the conditions were refractory to peroral vitamin therapy. Hence the importance of gastric function in the production and therapy of these diseases must be considered

PAUL STARR, M D

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Pemberton, J.: A Rapid Method of Differentiating Children with Large or Small Reserves of Vitamin C. *Brit. M. J.* 940 7

By determining the concentration of Vitamin C as milligrams per 100 c.c.m. of urine in a single specimen passed four hours after receiving a test dose of Vitamin C (5 mgm. per stone of body weight) it was possible accurately to differentiate subjects that had been on a high Vitamin C diet and those on a low Vitamin C intake. The former had in every case a concentration of from 5 to 75 mgm. per cent. those on the low diet, from 0.5 to 2.6 per cent. P. G. STARR, M.D.

Turtel, C. A., and Banfi, R. F. Prothrombin Studies. The Maintenance of Constant Concentration of Prothrombin in Normal Persons (Estudio sobre protrombina. Constantia de la concentraci6n de protrombina, en personas normales). *Sevensa Med.* 940 47 393

In a previous article the authors described a method of calculation of the concentration of prothrombin circulating in the plasma which utilizes the coagulation time of the blood.

They discuss the advantages and disadvantages of Al(OH)₃ and a few other technical details.

The results of their investigations show that the concentration of prothrombin in the blood in normal individuals remains on a relatively constant level. Determinations were made in the same individuals at various times of the same day and also on different days. JOSEPH K. KARAT, M.D.

Andrus, W. DeW., and Lord, J. W. J. Clinical Investigations of Some Factors Causing Prothrombin Deficiencies; Significance of the Liver in Their Production and Correction. *Arch. Surg.* 940, 4 396.

The history of the establishment of a prothrombin deficiency as the cause of the hemorrhagic tendency associated with jaundice and of the significance of Vitamin K in the production of this component of the clotting mechanism is briefly traced.

Clinical experience with crude extracts of substances containing the vitamin and later with the highly potent compound—methyl-4-naphthoquinone is reported.

Clinical cases are presented confirming various findings concerning the metabolism of Vitamin K and prothrombin in animals, reported in preceding paper. The important rôle of the liver is stressed and evidence is presented which indicates that damage to this organ may depress the level of plasma prothrombin and seriously interfere with the response to Vitamin K therapy.

Lord, J. W. J., Andrus, W. DeW. and Moore, R. A. The Metabolism of Vitamin K and the Role of the Liver in the Production of Prothrombin in Animals. *Arch. Surg.* 940, 4 3

A brief historical résumé of some of the experimental evidence concerning the relation between the hemorrhagic diathesis, plasma prothrombin, and Vitamin K is presented.

The protective effect on the liver of a carefully selected diet is demonstrated.

Bile must reach the intestinal tract for the proper absorption of the fat-soluble Vitamin K. The essential substance in bile is the bile salts.

In dogs with obstructive jaundice or biliary fistula, bile salts alone when fed by mouth in the absence of added Vitamin K do not suffice to prevent fall in the level of plasma prothrombin.

Vitamin K after absorption is stored in the liver. Partial loss of the stores of Vitamin K in the liver is reflected in a linear manner by fall in the level of plasma prothrombin.

The liver is the site of formation of plasma prothrombin. A healthy normally functioning liver is required for the maintenance of a normal level of plasma prothrombin.

A comparison has been made between the factors of which derangement result in pernicious anemia and the Vitamin K-plasma prothrombin relation. That these two entities are decidedly similar physiologically and anatomically is noted.

Prothrombin is continuously disappearing from the circulating blood, and experiments point to the lung as the site of this loss.

When plasma prothrombin falls to low levels because of inadequate absorption, hepatic damage, or both, the hemorrhagic tendency becomes manifest. The critical level of the plasma prothrombin is approximately 20 per cent of normal by the method used in these studies.

Meiklejohn, A. P. I. Thiamin the Antihemorrhagic Vitamin? *New England J. Med.* 940, 3 265

Thy polynuritis associated with alcoholism, pregnancy and gastro-intestinal disturbances is unquestionably due to nutritional deficiency, and is in every way similar to the polynuritis of Oriental beriberi. However, contrary to numerous statements in recent literature it has not been demonstrated that this polynuritis is due to the deficiency of thiamin.

For this reason it is of paramount importance that the treatment of nutritional polynuritis should include an ample and nutritious diet together with the administration of such preparations yeast and crude liver extract to ensure adequate supply of the entire Vitamin B complex. The efficacy of this treatment has been established by sound clinical experience. Sometimes additional thiamin is bene-

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PAUL STARR, M D

Koster H., and Shapiro, A. Serum Proteins and Wound Healing. *Arch. Surg.* 94, 4 73

The authors report the concentrations of total protein, albumin, and globulin, and the calculated protein oncotic pressure of serum in the cases of 53 patients whose operative wounds were carefully observed.

In general, patients who had deep infection or disruption of their wounds showed lower values for total protein and for oncotic pressure in their serum. This was due mainly to a diminution in the albumin fraction.

The finding of normal concentrations of serum protein and albumin in some patients with infected or disrupted wounds and of relatively low concentrations in some with clean wounds implies that hypoproteinemia by itself is neither a necessary nor sufficient condition for the development of wound infection or disruption. However the similarity in the concentrations of total serum protein and serum albumin and in the serum protein oncotic pressure in the groups with deep infection and wound disruption suggests the idea that the poor nutritional state of which hypoproteinemia is manifestation, may favor both the development of deep infection and the disruption of clean wounds.

SURGERY H. KLEIN, M.D.

Parsons-Smith, B. Pulmonary Embolism and Infarction. *Br. M. J.* 94, 39

It is generally known that pulmonary embolism and infarction should be regarded as major circulatory emergencies, and although these conditions are still, more often than not, unsuspected or in doubt until post mortem examination, there is fortunately good reason to assume that their clinical features have in recent years become clearly defined, and in consequence the percentage of correct diagnoses has increased materially.

A large variety of factors are concerned in the formation of the thrombus from which the embolus originates and the more important of these can best be exemplified by reference to typical post-operative cases. In such cases it is possible to trace primary factors and contributory causes. The former include local trauma to the tissues and blood vessels and the presence of organisms; the latter comprise several morbid developments as follows: (1) slowing of the blood stream, induced partly by recumbency and diminished muscular action, also partly by constricting bandages and postoperative immobility and by the halloxy respiratory which impairs aspiration from the greater veins of the chest and abdomen; (2) chemical and physical changes in the blood—for example dehydration with concentration of the stream and an increase of the fibrinogen, the calcium content and the platelet count; and (3) localized areas of injury in the vascular endothelium.

In certain number of cases an embolus is immediately fatal in itself, characteristic series of signs and symptoms may be observed for varying periods

before death, the patient being suddenly seized with urgent breathlessness, faintness, and feelings of alarmingly severe subternal oppression which tend to persist in spite of treatment. The physical examination discloses the shock syndrome in its entirety. Characteristic signs include pallor, sweating, bradycardia and dilated pupils; the pulse is rapid and soft, and the blood pressure considerably lowered; the respiratory rate is accelerated and the expiration usually much diminished; collapse, often ushered in by uncontrollable vomiting, deepens and unconsciousness as a general rule precedes the fatal issue.

F. C. MERRILL, M.D.

Turrell, R., Marino, A. W. M. and Nerb, L.: Studies on the Absorption of Sulfanilamide from the Large Intestine. *J. Surg.* 94, 47

In order to determine whether sulfanilamide is absorbed directly from the colon, or whether it passes into the ileum and is absorbed there, the authors used a subject who had no communication between the small bowel and the colon as the result of permanent ileostomy with excision. After the rectal administration of 14 gm. of sulfanilamide over a period of about sixty-five hours the blood showed a concentration of 15 mgm. of combined sulfanilamide per 100 c.c.m.

In the investigation of the absorption of the drug from the rectum, patient as utilized who had had a resection of the sigmoid for carcinoma. After the administration of 18 gm. of sulfanilamide in solution into the rectal pouch over a period of three days, the concentration in the blood was 17 mgm. of combined sulfanilamide per 100 c.c.m. The absorption of the drug from the rectum and colon when given in suppository form was also studied. Sulfanilamide was absorbed from the rectum and colon when given either in solution or in suppositories. High concentrations in the blood were noted after the rectal administration of the drug in solution. The rectal route is recommended whenever the oral route can not be utilized. The same total dosage may be used for the rectal as for the oral administration.

WALTER H. NADLER, M.D.

Tragertman, L. J. and Goto, J. M.: Fatal Reactions to the Administration of Sulfanilamide Drugs. *J. Lab. & Clin. Med.* 94, 5 65

Five deaths from sulfanilamide preparations are reported from the pathology service of the Los Angeles County Hospital. Three were due to granulocytopenia, 2 to hemolytic anemia and 3 to liver and kidney damage. Granulocytopenia developed in patient with scarlet fever who received 1 gm. of sulfanilamide and in another patient who received 64 gm. for streptococcal sore throat. The third patient had been given 85 gms. of salicylpyridine in the treatment of bacterial endocarditis. In the 2 instances in which the bone marrow was examined, necropsy demonstrated arrest of the myeloid series occurred at the myelocyte level. Acute hemolytic anemia appeared within three days in a patient with

erysipelas who received 25 gm of sulfanilamide. In this case interference with renal tubular function by precipitated hemoglobin derivatives was considered a major factor leading to death. Clinical evidence of severe liver and kidney damage was observed in 1 patient with gonorrheal arthritis after the administration of 34 gm of sulfanilamide. Degeneration of the hepatic cells and necrosis of the renal tubular epithelium were found at autopsy.

WALTER H. NADLER, M.D.

DUCTLESS GLANDS

Kepler, E. J., and Randall, I. M. *Fundamental Concepts in Endocrine Diagnosis and Therapy*. *Med Clin North Am*, 1940, 24: 941.

In many respects the glands of internal secretion are similar to chemical factories. Raw chemical materials are brought to the glands, and new compounds are manufactured and transported elsewhere for use. These new compounds, known as "hormones," set up specific types of physiological activity in cells or receptors which have the capacity to respond to their presence. In the main there are two types of hormones. Hormones of the first type influence primarily intracellular and extracellular chemical reactions and thereby serve to keep the chemical interchanges of the body constant within physiological limits. Hormones of the second type coordinate the function of certain cells and organs with other organs or with the needs and activities of the organism as a whole.

Diseases of the endocrine glands are usually, but not always, accompanied by quantitative changes in the secretory activity of the diseased organ. In some cases there is evidence that the gland synthesizes an abnormal chemical molecule with properties that may differ materially from those of the normal hormone.

Organic endocrine diseases are usually associated with structural changes in the gland at fault.

1. Glandular hyperfunction is usually associated with (a) diffuse hyperplasia or hypertrophy of the entire gland, or with (b) adenomatous or malignant tumors.

2. Primary glandular hypofunction is frequently found with (a) hypoplastic lesions, or (b) destructive lesions of the glandular parenchyma.

Most of the glands have relatively large factors of safety, so that most of the parenchyma has to be destroyed before symptoms of hypofunction appear. Furthermore, there is evidence to suggest that, as progressive lesions destroy more and more of the gland, the residual healthy glandular tissue compensates by becoming hypertrophic. Secondary glandular hypofunction results from anterior pituitary insufficiency, which may follow an organic lesion of the pituitary body, metabolic disorders, poor hygienic conditions, or systemic disease elsewhere in the body.

Adenomas without clinical evidence of hyperfunction are frequently found at necropsy. This finding

does not imply that such adenomas were not functioning. It usually does signify that the sum total of hormone that was made by the adenomatous and non adenomatous tissue was not excessive.

The outstanding characteristic of hyperfunctioning adenomas is their tendency to function irrespective of the needs of the body. Apparently, they are not inhibited by the normal mechanisms that regulate glandular secretory activity.

When adenomatous tissue hyperfunctions, the remaining non adenomatous glandular tissue from which the adenoma was derived tends to hypofunction and may become functionally inadequate or even atrophic. Such atrophic tissue usually regenerates if the adenoma is removed, but until regeneration or renewal of function does occur there may be a period in which the body suffers from an inadequate supply of the hormone that had been manufactured by the adenoma.

With few exceptions, the effective treatment of hyperfunctioning lesions is surgical. If the lesion is a benign or operable neoplasm, the surgical removal of the tumor usually results in cure. On the other hand, if the lesion is hyperplastic, the surgical reduction of the mass of hyperplastic tissue is less likely to be of benefit except in cases of exophthalmic goiter. If surgical treatment is inadvisable, roentgen therapy may reduce the mass of hyperfunctioning tissue.

Attempts to depress the hormonal output of hyperplastic or neoplastic tissue by the administration of large amounts of a hormone that is thought to be antagonistic to the diseased gland have yielded either unsatisfactory or equivocal results.

If an endocrine gland is destroyed or incapacitated by disease, the resulting symptoms of hypofunction usually can be controlled by the administration of its hormone. Replacement therapy should be sharply distinguished from stimulating therapy. The former is indicated when an endocrine gland is hopelessly damaged, the latter, when a gland is anatomically capable of functioning but for various reasons does not do so. Replacement therapy should not be used indiscriminately. It does not stimulate either a normal or a diseased gland to produce its own hormone, and as a general rule, therefore, it should not be administered when the objective is an increase in the ability of a gland to deliver its own product. In fact, long continued administration of a hormone in large amounts may actually inhibit the secretory activity of any healthy tissue which is secreting that hormone, so that the end result is a situation comparable to disuse atrophy.

Cervifio, J. M., and Pérez del Castillo, C. *The Growth Hormone in the Treatment of Infantile Hypopituitarism with Delayed Growth* (El hormona del crecimiento en el tratamiento de los hipopituitarismos infantiles con retrasos graves de la talla). *An Fac de med de Montevideo*, 1940, 25: 536.

The growth hormone secreted by the eosinophil cells of the anterior lobe of the hypophysis has been

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PAUL MIRANDA, M.D.

Turull, R., Marino, A. W. M. and Nerik, L. Studies on the Absorption of Sulfanilamide from the Large Intestine. *Ann Surg* 940, 47.

In order to determine whether sulfanilamide is absorbed directly from the colon, or whether it passes into the ileum and is absorbed there, the authors used a subject who had no communication between the small bowel and the colon, the result of permanent ileostomy with excision. After the rectal administration of 4 gm. of sulfanilamide over a period of about sixty-five hours the blood showed a concentration of 5 mgm. of combined sulfanilamide per 100 c.c.m.

In the investigation of the absorption of the drug from the rectum, patient was utilized who had had resection of the sigmoid for carcinoma. After the administration of 8 gm. of sulfanilamide in solution into the rectal pouch over a period of three days, the concentration in the blood was 1 mgm. of combined sulfanilamide per 100 c.c.m. The absorption of the drug from the rectum and colon when given in suppository form was also studied. Sulfanilamide is absorbed from the rectum and colon when given either in solutions or in suppositories. High concentrations in the blood are noted after the rectal administration of the drug in solution. The rectal route is recommended whenever the oral route cannot be utilized. The same total dosage may be used for the rectal as for the oral administration.

WALTER H. NADLER, M.D.

Tragerman, L. J. and Goto, J. M. Fatal Reactions to the Administration of Sulfanilamide Drugs. *J Lab & Clin Med* 940, 5 63.

Five deaths from sulfanilamide preparations are reported from the pathology service of the Los Angeles County Hospital. Three are due to granulocytopenia, to hemolytic anemia and to liver and kidney damage. Granulocytopenia developed in patient who had fever; he received 1 gm. of sulfanilamide and another patient who received 64 gm. for streptococcal sore throat. The third patient had been given 85.5 gm. of sulfapyridine in the treatment of bacterial endocarditis. In the instances in which the bone marrow was examined at necropsy maturation arrest of the myeloid series occurred; the myelocyte level. Acute hemolytic anemia appeared within three days in a patient with

erysipelas who received 25 gm of sulfanilamide. In this case interference with renal tubular function by precipitated hemoglobin derivatives was considered a major factor leading to death. Clinical evidence of severe liver and kidney damage was observed in 1 patient with gonorrheal arthritis after the administration of 34 gm of sulfanilamide. Degeneration of the hepatic cells and necrosis of the renal tubular epithelium were found at autopsy.

WALTER H. NADLER, M.D.

DUCTLESS GLANDS

Kepler, E. J., and Randall, L. M. *Fundamental Concepts in Endocrine Diagnosis and Therapy*. *Med Clin North Am*, 1940, 24: 941.

In many respects the glands of internal secretion are similar to chemical factories. Raw chemical materials are brought to the glands, and new compounds are manufactured and transported elsewhere for use. These new compounds, known as "hormones," set up specific types of physiological activity in cells or receptors which have the capacity to respond to their presence. In the main there are two types of hormones. Hormones of the first type influence primarily intracellular and extracellular chemical reactions and thereby serve to keep the chemical interchanges of the body constant within physiological limits. Hormones of the second type coordinate the function of certain cells and organs with other organs or with the needs and activities of the organism as a whole.

Diseases of the endocrine glands are usually, but not always, accompanied by quantitative changes in the secretory activity of the diseased organ. In some cases there is evidence that the gland synthesizes an abnormal chemical molecule with properties that may differ materially from those of the normal hormone.

Organic endocrine diseases are usually associated with structural changes in the gland at fault.

1. Glandular hyperfunction is usually associated with (a) diffuse hyperplasia or hypertrophy of the entire gland, or with (b) adenomatous or malignant tumors.

2. Primary glandular hypofunction is frequently found with (a) hypoplastic lesions, or (b) destructive lesions of the glandular parenchyma.

Most of the glands have relatively large factors of safety, so that most of the parenchyma has to be destroyed before symptoms of hypofunction appear. Furthermore, there is evidence to suggest that, as progressive lesions destroy more and more of the gland, the residual healthy glandular tissue compensates by becoming hypertrophic. Secondary glandular hypofunction results from anterior pituitary insufficiency, which may follow an organic lesion of the pituitary body, metabolic disorders, poor hygienic conditions, or systemic disease elsewhere in the body.

Adenomas without clinical evidence of hyperfunction are frequently found at necropsy. This finding

does not imply that such adenomas were not functioning. It usually does signify that the sum total of hormone that was made by the adenomatous and non adenomatous tissue was not excessive.

The outstanding characteristic of hyperfunctioning adenomas is their tendency to function irrespective of the needs of the body. Apparently, they are not inhibited by the normal mechanisms that regulate glandular secretory activity.

When adenomatous tissue hyperfunctions, the remaining non adenomatous glandular tissue from which the adenoma was derived tends to hypofunction and may become functionally inadequate or even atrophic. Such atrophic tissue usually regenerates if the adenoma is removed, but until regeneration or renewal of function does occur there may be a period in which the body suffers from an inadequate supply of the hormone that had been manufactured by the adenoma.

With few exceptions, the effective treatment of hyperfunctioning lesions is surgical. If the lesion is a benign or operable neoplasm, the surgical removal of the tumor usually results in cure. On the other hand, if the lesion is hyperplastic, the surgical reduction of the mass of hyperplastic tissue is less likely to be of benefit except in cases of exophthalmic goiter. If surgical treatment is inadvisable, roentgen therapy may reduce the mass of hyperfunctioning tissue.

Attempts to depress the hormonal output of hyperplastic or neoplastic tissue by the administration of large amounts of a hormone that is thought to be antagonistic to the diseased gland have yielded either unsatisfactory or equivocal results.

If an endocrine gland is destroyed or incapacitated by disease, the resulting symptoms of hypofunction usually can be controlled by the administration of its hormone. Replacement therapy should be sharply distinguished from stimulating therapy. The former is indicated when an endocrine gland is hopelessly damaged, the latter, when a gland is anatomically capable of functioning but for various reasons does not do so. Replacement therapy should not be used indiscriminately. It does not stimulate either a normal or a diseased gland to produce its own hormone, and as a general rule, therefore, it should not be administered when the objective is an increase in the ability of a gland to deliver its own product. In fact, long-continued administration of a hormone in large amounts may actually inhibit the secretory activity of any healthy tissue which is secreting that hormone, so that the end-result is a situation comparable to disuse atrophy.

Cerviño, J. M., and Pérez del Castillo, C. *The Growth Hormone in the Treatment of Infantile Hypopituitarism with Delayed Growth* (La hormona del crecimiento en el tratamiento de los hipopituitarismos infantiles con retrasos graves de la talla). *An Fac de med de Montevideo*, 1940, 25: 536.

The growth hormone secreted by the eosinophil cells of the anterior lobe of the hypophysis has been

isolated and purified by various investigators. These preparations have been tried on hypophysectomized rats and have been found to induce a gain in weight of from 20 to 50 gm. after twenty days. The effect of this hormone diminishes with increasing age of the animal. Its injection for several months in young dogs caused a definite increase in the growth of bone and muscle, as well as the organ without a noteworthy effect on the genitalia. Frequently a glycosuria was observed, and even a true diabetes, which disappeared after cessation of the treatment. The production of the growth hormone in the human being is greatest in the first three years of life but persists abundantly during youth and adolescence as well as in the acromegalic tendency of pregnancy. In the present state of our knowledge it is practically impossible to determine whether this hormone action is effected directly on the cells or through the intermediary action of other endocrine glands. Some authors consider the thymus the intermediary gland. The thyroid counteracts the effect of the hormone although excision of the thyroid gland does not nullify the action of the hormone. The authors emphasize that all organic cells have the faculty of growth and reproduction. This faculty is stimulated and controlled by the hormone secreted by the eosinophil cells of the anterior hypophysis.

The isolation of this hormone by Evans and Long in 1931 opened up new horizons in the treatment of pituitary dwarfism. The authors review briefly the literature the clinical application of the growth hormone thus far. Their own studies based on a series of more than 5 cases are less favorable than the literature would indicate thus far. The age of the authors' patients varied between eight and seventeen years. The duration of treatment from several months to one year. The authors report briefly on 4 cases of pituitary dwarfism. Antitoxin C was used for treatment. The duration of treatment between 21 months and a year. In this group the growth hormone by itself produced no definite improvement in growth. The only improvement as observed in case of mixed glandular type in which thyroid administration caused definite growth even without the administration of the growth hormone. However the patients gained in weight and improved in their subjective reactions.

In the case reports of results obtained after several years' treatment as found in the literature the authors point out that even in pituitary dwarfism there may be periods of spontaneous growth. If reports in detail such case in which there is considerable growth in the prepuberty period before any endocrine treatment had ever been given to the patient. Since the usual period of treatment for such cases is for number of years, the authors indicate the fallacy of ascribing all improvement to the administration of the growth hormone.

The authors note that the growth hormone produces its most marked curative effects before the age of three years. In this age group the authors had 5 patients, including a pair of fourteen-month-old

female twins and a seventeen-month-old female Mongolian idiot. A definite stimulation of growth was observed in these patients. It is noteworthy that the weight curve fluctuated markedly. The appetite was enormously stimulated, in some cases amounting to bouldism. With the exaggerated appetite there was also noted the frequent occurrence of gastro-intestinal disturbances such as vomiting and diarrhea. Graphic illustrations are presented to summarize the results of treatment with growth hormone in the 5 patients under three years of age.

JACOB E. KLEIN, M.D.

Westman, A. Clinical and Experimental Studies of Hypophysis Transplants (Klinische und experimentelle Untersuchungen ueber Hypophysentransplantationen) *Acta Med et Scand* 1930, 30: 15

Ovarian hormone and, recently gonadotropic hormones have been used in the treatment of amenorrhea with varying results. In many patients (in therapy has yielded either no or only temporary (substitutive action) results. Encouraged by the successful results reported by Bergmann and others, following transplantation of the hypophyseal glands obtained from calves, the author undertook a clinical study in an attempt to explain these results. Animal experiments dealing with this problem have yielded extremely variable results.

Hartman working with guinea pigs, reported that the ovaries in the animals in which the transplantation of pituitary tissue had been successful showed the presence of follicles of varying sizes but no evidence of ovulation or fertilization. The transplant, therefore, exerts a gonadotropic A-effect but the B-effect is lacking. The absence of the B-effect is attributed to the fact that the transplanted pituitary tissue has no connection with the brain and is therefore, not subject to the regulatory action of the sexual center (supposedly in the midbrain) which controls the production of the gonadotropic hormone.

A series of hypophyseal transplant carried out in rats which had been hypophysectomized led to ovarian trophism in all of the animals although microscopic studies showed that the transplant had successfully survived. It was observed, however, that the hypophysectomized animals which transplants appeared to be in better general condition than those in whom no pituitary tissue was transplanted.

A transplant of hypophyses obtained from freshly killed calves was undertaken in cases of amenorrhea (3 primary 7 secondary). In each case 2 hypophyseal glands were implanted in the labrum majus. Eight of these patients showed no results.

Menstruation appeared. It should be noted, however, that these cases differed from the others because in addition to amenorrhea both of them had exhibited other endocrine disturbances which are favorably influenced by the hypophyseal transplant. In these cases, the transplant had evidently stimulated the patient's own pituitary gland to stronger

activity in a manner not possible with the usual hormone therapy

The author did not have an opportunity to determine whether the transplanted glands had successfully survived. Therefore, he is of the opinion that this procedure should be termed hypophyseal transfer rather than transplant

HARRY A. SALZMANN, M D

Blumenthal, H. T. The Effect of Fresh and Experimentally Modified Anterior Lobe of the Hypophysis of Cattle on the Mitotic Activity in the Adrenal Cortex of the Guinea Pig. *Endocrinology*, 1940, 27, 486

The implantation of fresh anterior lobe of the hypophysis of cattle into immature female guinea pigs causes an increase of mitotic activity in the adrenal cortex of these animals. If an acid extract of the hypophysis is injected or if the hypophysis is injected after it is immersed in 95 per cent alcohol, acetone, glycerine, or 50 per cent urea, or after it is treated with combinations of urea and glycerine, a similar but less marked increase in mitotic activity is observed. If the cattle gland is immersed in both urea and 95 per cent alcohol, little or no increase in mitoses occurs. This result is attributed to the fact that 50 per cent urea extracts a part of the hormone which is responsible for increased mitotic proliferation. If the cattle gland is treated with acetone or saturated ammonium sulfate before immersion in urea, this extractive effect of urea is diminished.

The authors find that mitotic activity in the adrenal cortex is a more sensitive indicator for the effect of certain hormones than is a study of weight changes in the gland.

EDWARD W. GIBBS, M D

Fels, E. Experimental Investigations on the Interchange of Sex Hormones in Parabiosis. The Quantity of Hormones Necessary for Interchange (Investigaciones experimentales sobre el intercambio de las hormonas sexuales en la parabiosis. Las cantidades hormonales necesarias para el intercambio). *An. Fac. de med. de Montevideo*, 1940, 25, 600

Parabiosis, particularly celio anastomosis (the union of both abdominal cavities) is the most intimate experimental communication of two organisms which guarantees the greatest possible humoral exchange. For this reason the author has frequently used this method to study certain biological problems in the activity of sex hormones.

He has found that in animals of the same sex the sex glands and functions are not influenced by parabiosis, because the normal amounts of hormones secreted by each animal are not sufficient to influence the other animal. For the same reason, in parabiosis the castrated rat is not influenced by the sex hormones of the normal animal. The gonad stimulating hormones of the anterior hypophysis are more readily transmitted to the companion animal than the estrogenic hormones. The author reviews the pertinent literature on this subject. There is con-

siderable divergence of opinion as to the activity of follicular hormone in parabiosis. The author carried out some quantitative studies to clarify some of these divergent opinions. He made 17 experiments on 5 pairs of parabiotic animals. Quantitative studies show that estrogenic hormone passes from one animal to the other only if a minimum of from 800 to 1,000 units is injected, also the same amount injected in fractional doses exerts a greater effect than if it is injected in one large dose. To induce estrus in both parabiotic animals it takes more than twice as much as the amount required to induce estrus in each individual animal—usually four or five times as much is required. This is explained by the fact that the hormone in passing through the first animal is inactivated by the liver and the reticulo endothelial system of the first animal. The gonadotropic hormones are not destroyed in passage and therefore pass over very readily to the other animal in the parabiosis.

The author carried out a similar series of studies on 13 pairs of parabiotic animals—normal males, castrated males, normal immature females, and castrated females—in the study of the effect of male sex hormone (testosterone propionate). In females 5 mgm of male hormone was sufficient to cause an effect, but this was inadequate in males. This is explained by the author as being due to the ease with which sex reactions are observed in the vagina, as compared with the difficulty of observing such changes in the male. The author presents tables and photomicrographs in illustration of the data and findings of his experiments.

JACOB E. KLEIN, M D

Fels, E. Experimental Investigations on the Interchange of Sex Hormones in Parabiosis. The Effect of Transplanting the Testes (Investigaciones experimentales sobre el intercambio de las hormonas sexuales en la parabiosis. El efecto hormonal del testículo transplantado). *An. Fac. de med. de Montevideo*, 1940, 25, 610

The author reports a series of 9 parabiotic experiments in which 2 male animals were united surgically in the dorsal region, instead of in the abdominal region as in previous experiments. One of the couple was castrated and the testes of the other were transplanted into the scrotum of the castrated animal by means of a pedicled graft, the deferent duct and spermatic vessels being used.

In all of the instances atrophy of the genitalia was observed in the castrated animal. Microscopic study of the hypophysis showed the changes usually found in castrated animals. The hypophysis of the other animal, which furnished the testes transplant, was normal. In all of the cases there was more or less degeneration noted in the transplanted testes.

The author concludes that in spite of transplantation of the testes the male sexual hormone acts only on the normal animal, without any influence on the castrated animal. He points out that in transplantation experiments the testes are more sensitive to

trauma and toxaemia than the ovaries. I previous experiments the author demonstrated that the ovary transplanted intact into a castrated female animal at the same way as has been indicated. It concludes that the gonads of both sexes could act themselves in the same way as concerns their hormonal function in parabiosis.

JACOB E. KLEIN, M.D.

Siegler, S. L. Further Experiences with the Hormone of Pregnant Mare Serum. *Endocrinology* 44, 7 357

The author has produced ovulation in the rabbit, immature monkey and human being by the use of the hormone of pregnant-mare serum. The ability of this hormone to stimulate ovulation has been confirmed by the study of repeated endometrial biopsies, vaginal smears, and urinary analyses for sodium pregnandiol glycuronide. The effect produced by injection of the serum is similar to that of the normal gonadotropic secretion of the anterior pituitary gland.

EDWARD W. GEHR, M.D.

Dripe, D. G., and Osterberg, A. E. An Evaluation of Colorimetric and Biological Method for Determining Urinary Androgens. *Endocrinology* 94, 2 345.

Because of an increased interest of clinicians in testosterone as an aid to treatment in gynecology it seemed desirable to try to find some simple method for the determination of the content of androgens in the urine which we might use in certain cases in which there is clinical evidence of endocrinological dysfunction.

Because of its simplicity the colorimetric method of Oestling with Hellfige colorimeter was used. The color is expressed directly in color units read from the color disc of the colorimeter and the number of color units in a twenty-four-hour specimen of urine is calculated.

The biological method used for the determination of urinary androgens requires the selection of 3 litter-mate male rats twenty-one or twenty-two days old. The testes are removed from these animals the third being used as normal litter-mate control. Ten days after castration injections are started on the experimental animal. One castrated animal is used as an un.injected castrated control. Five-tenths of one cubic centimeter of urine extract is injected twice daily for seven consecutive days, which makes a total of 7 c.c.m. of extract. The rats are killed on the day following the last injection or at thirty-eight days of age. The seminal vesicles and prostate gland are removed. In the rat the anterior portion of the prostate gland is made up of the lobes, one lobe lying within the fascia of each seminal vesicle. This portion of the prostate gland is weighed with the seminal vesicles. Extraneous connective tissue and fat is removed from the seminal vesicles and the two are weighed together. The posterior portion of the prostate gland is separated from the middle part and each lobe is weighed separately. All free tissues are fixed in Bouin's fluid. One seminal vesicle and

the posterior portion of the prostate gland are imbedded in paraffin, sectioned, and stained with hematoxylin and eosin preparatory to histological examination.

The degree of androgenic activity of the injected extract is determined by the state of the secretory tissue in the seminal vesicle and posterior lobe of the prostate gland of the animal receiving the extract. The indicators of the hormonal activity in the test extract relative to the group of eight of the animal organs and the histological aspects of the organs. It has been found that a dosage of 0.5 mgm. daily will bring about response in the epithelium of the seminal vesicles which correlates reasonably well with that of the normal thirty-eight day rat. The epithelium of the prostate is brought up to a little better than normal by this same dosage. Both these organs will respond to stimulation in excess of the normal response for their age. The degree above and below the normal is determined by comparison with androsterone standards.

Our biological determinations are expressed in terms of crystalline androsterone. It has been difficult to correlate these with the color units, but it could seem that the biological reaction to mgm. of androsterone might be equivalent to about 50 color units. There is apparently considerable chance for error arising from both methods. There seems to be less variation in the content of androgens from day to day in the same individual as determined by the biological method than there is as determined by the colorimetric method. The colorimetric method will certainly determine the presence of androgenic material and will serve as a guide at least for biological assays.

The best test of any method is to evaluate it from the clinical standpoint. The content of estrogens and androgens in the urine of normal adult men and women was studied first. It makes there would seem to be less variation in the androgen content from day to day than in females. We have not found any definite cyclic excretion in the normal female although there tends to be an increase in excretion premenstrually. The average of the twenty-four hour amounts of androgens in males as 0.3 mgm. based on 7 determinations in different individuals. In females, the average was 7.4 mgm. based on 16 determinations, the highest being 16.1 mgm. and the lowest 5 mgm.

After working out our standard in the normal, group of abnormal men and women was studied. This group of patients is still too small to serve as basis on which to formulate any conclusions, but the results could seem to justify the methods used.

It could appear therefore, that the epithelium of the seminal vesicles of the immature castrated rat can be used to advantage in method for determining amounts of male hormones in the urine and that Hellfige colorimeter method, which is much simpler than the biological method, may also be used. Both methods are crude but approximately exact enough to be used as clinical guides for treatment.

Hooker, C W, Gardner, W U, and Pfeiffer, C A
 Testicular Tumors in Mice Receiving Estrogens *J Im Med*, 1940, 115 443

During the course of prolonged treatment with large amounts of estrogen, the glandular interstitial tissue of the testes in mice of the Strong A strain was observed to hypertrophy to such an extent that large areas of the testes were composed entirely of these cells. In the absence of local invasion or of metastases these overgrowths were not considered malignant.

However, a large interstitial cell tumor of the testes which metastasized to the lumbar and renal lymph nodes developed in a mouse of the A strain which had received weekly subcutaneous injections of 0.05 mgm of estradiol benzoate for a period of two hundred and sixty-four days. Histologically, the testicular tumor and the metastatic lesions were identical and revealed unquestionably malignant characteristics.

A large tumor of the glandular interstitial cells also developed in 1 mouse of the A strain which had received 250 micrograms of stilbestrol weekly from the thirty-sixth to the two hundred and eightieth day of life. This tumor was slightly smaller, measuring 10 mm in diameter, but it was almost identical histologically with the tumor in the mouse treated with estradiol benzoate and was unassociated with metastases; it was therefore considered to be malignant.

ANTHONY F SAVA, M D

EXPERIMENTAL SURGERY

Sturmacker, H B, Jr, Firor, W M, and Lamont, A
 A Toxin-Antitoxin Reactions in Experimental Tetanus *Bull Johns Hopkins Hosp*, Baltimore, 1940, 67 92

The authors have extended previous studies to include the protecting values of antitoxin against toxin introduced intravenously, intramuscularly, intracutaneously, and subcutaneously in both tetanus-resistant and tetanus sensitive laboratory animals. In this report experimental observations are given along with an appreciation of their significance in relation to certain theories heretofore proposed in the literature.

Certain differences exist in the protecting power of antitoxin against toxin introduced by various routes. When toxin and antitoxin are mixed *in vitro* and then injected intramuscularly a unit of antitoxin is capable of protecting against from 15 to 9 times more toxin than when the two are injected separately into the veins. This may mean that when there is present in the blood stream of an animal a certain amount of toxin and an excess of antitoxin as measured by the *in vitro* protecting value, neutralization of each molecule of toxin in the blood stream is not instantly and completely effected, which permits a portion of the toxin to escape and become fixed in the body tissues where it is at first more difficult to neutralize and eventually cannot be neutralized. While it was long thought that once toxin became fixed it could

no longer be neutralized it has been shown that toxin can be neutralized by antitoxin up to a certain point in the period of incubation and that this antitoxin must be present in great excess to accomplish this end.

The observation of the authors shows further that the antitoxin delivered into the blood stream is less effective against toxin injected intradermally, subcutaneously, or intramuscularly than against toxin injected intravenously. The differences in the protecting power of antitoxin against toxin introduced by various peripheral routes are not great. When toxin is injected into muscle, skin, or subcutaneous tissue from 4 to 20 times more antitoxin is required for neutralization than after the intravenous injection of toxin. A very great difference is noted when we compare the protecting power of antitoxin against toxin placed directly in the lumbar cord with the protecting power of antitoxin against toxin given intravenously. When injected into the blood stream a unit of antitoxin will protect against 7,000 times as many guinea pig median lethal doses as when the toxin is placed in the lumbar cord.

It was shown further that in experiments in which antitoxin is injected intravenously the amount of toxin neutralized in any one species should be proportional to the amount of antitoxin given or to the concentration of antitoxin in the blood stream. Concentration of the toxin after it has been injected into the muscle or the skin is not known.

The authors finally point out that antitoxin is more effective in tetanus resistant than in tetanus-sensitive animals. The number of toxin units that are neutralized is least in the very sensitive guinea pig, greater in the slightly less sensitive mouse, and still greater in the resistant dog or cat. This resistance cannot be explained either by the difference in the lethal dose for each species or by a difference in concentration of the antitoxin.

ANTHONY F SAVA, M D

Bale, W F. The Use of Artificially Produced Radio-Active Elements As Tagged Atoms in Biological Research *Radiology*, 1940, 35 184

The author obtained, from Lawrence and Kamen of the Radiation Laboratory of the University of California, radio active iron in the form of ferric chloride, which he fed to experimental animals. The radio activity was obtained by bombarding the iron in the cyclotron with deuterons. The isotope activated is the one with an atomic weight of 58, the reaction being $\text{Fe}^{56} + \text{H}^2 \rightarrow \text{Fe}^{58} + \text{p}$. In a typical sample of radio iron, this isotope constitutes less than 1 per cent of the total weight of the iron, so that the activity is rather weak. However, with the aid of a Geiger-Muller counter and a specially adapted technique by which quantitative measurements were made in solutions, the author was able to trace the path of this tagged iron in the blood of the animals.

The experiments consisted of feeding aliquots of the radio iron to (1) anemic and (2) plethoric dogs

trauma and toxemia than the ovaries. In previous experiments the author demonstrated that the ovary transplanted into a castrated female animal acts the same way as has been indicated. It concludes that the gonads of both sexes conduct themselves in the same way as concerns their hormonal function in parabiosis.

JACOB E. KATZ, M.D.

Stegler, S. L. Further Experiences with the Hormone of Pregnant Mare Serum. *Endocrinology* 949, 7: 337

The author has produced ovulation in the rabbit, immature monkey and human being by the use of the hormone of pregnant mare serum. The ability of this hormone to stimulate ovulation has been confirmed by the study of repeated endometrial biopsies, vaginal menses and urinary analyses of sodium pregnandiol glyconate. The effect produced by injection of the serum is similar to that of the normal gonadotropic secretion of the anterior pituitary gland.

EDWARD W. GIBBS, M.D.

Dripe, D. G. and Osterberg, A. E. An Evaluation of Colorimetric and Biological Methods for Determining Urinary Androgens. *Endocrinology* 949, 37: 343

Because of an increased interest of clinicians in testosterone as an aid to treatment in gynecology it seemed desirable to try to find some simple method for the determination of the content of androgens in the urine which we might use in certain cases in which there is clinical evidence of endocrinological dysfunction.

Because of its simplicity the colorimetric method of Oestling with Hellige's colorimeter was used. The color is expressed directly in color units read from the color disc of the colorimeter and the number of color units in a twenty-four-hour specimen of urine is calculated.

The biological method used for the determination of urinary androgens requires the selection of 3 littermate male rats twenty-one or twenty-two days old. The testes are removed from one of these animals, the third being used as normal littermate control. Ten days after castration injections are started on the experimental animal. One castrated animal is used as an un.injected castrated control. Five tenths of one cubic centimeter of urine extract is injected twice daily for seven consecutive days which makes a total of 7 c.c.m. of extract. The rats are killed on the day following the last injection or at thirty-eight days of age. The seminal vesicles and prostate gland are removed. In the rat the anterior portion of the prostate gland is made up of two lobes, one lobe lying within the fascia of each seminal vesicle. This portion of the prostate gland is weighed with the seminal vesicles. Extraneous connective tissue and fat is removed from the seminal vesicles and the two are weighed together. The posterior portion of the prostate gland is separated from the middle part and each lobe is weighed separately. All free themes are fixed in Bouin's fluid. One seminal vesicle and

the posterior portion of the prostate gland are embedded in paraffin, sectioned, and stained with hematoxylin and eosin preparatory to histological examination.

The degree of androgenic activity of the injected extract is determined by the state of the secretory tissue in the seminal vesicle and posterior lobe of the prostate gland of the animal receiving the extract. The indicators of the hormonal activity in the test extract are two: the gross weight of the animal organs and the histological aspects of the organs. It has been found that a dosage of 5 mgm. daily will bring about a response in the epithelium of the seminal vesicles which correlates reasonably well with that of the normal thirty-eight day rat. The epithelium of the prostate is brought out a little better than normal by this same dosage. Both these organs will respond to stimulation in excess of the normal response for their part. The degree above and below the normal is determined by comparison with androsterone standards.

Our biological determinations are expressed in terms of crystalline androsterone. It has been difficult to correlate these with the color units, but it would seem that the biological reaction to 5 mgm. of androsterone might be equivalent to about 30 color units. There is apparently considerable chance for error arising from both methods. There seems to be less variation in the content of androgens from day to day in the same individual as determined by the biological method than there is as determined by the colorimetric method. The colorimetric method will certainly determine the presence of androgenic material and will serve as a guide at least for biological ways.

The best test of any method is to evaluate it from the clinical standpoint. The content of estrogens and androgens in the urine of normal adult men and women was studied first. In males there would seem to be less variation in the androgen content from day to day than in females. We have not found any definite cyclic excretion in the normal female although there tends to be an increase in excretion premenstrually. The average of the twenty-four hour amounts of androgen in males as 0.3 mgm. based on 7 determinations in different individuals. In females, the average was 7.4 mgm. based on 26 determinations, the highest being 16.5 mgm. and the lowest 3 mgm.

After looking out on standard in the normal, a group of binormal men and women was studied. This group of 12 patients is still too small to serve as a basis on which to formulate any conclusions, but the results would seem to justify the method used.

It could appear therefore that the epithelium of the seminal vesicles of the immature castrated rat can be used advantageously in a method for determining amounts of male hormones in the urine, and that Hellige's colorimeter method, which is much simpler than the biological method, may also be used. Both methods are crude but approximately exact enough to be used as clinical guides for treatment.

Blood samples were then taken at various intervals, the plasma and cells separated, the iron was extracted and the radioactivity measured with the Geiger Muller counter in units of so many counts per minute. From hematocrits and blood volume determination the concentration of the tagged iron in the circulating blood was finally estimated.

The conclusion is reached that the absorption of the iron is determined by the need of the body. In the anemic dogs the assimilation was prompt whereas in the pletoric animals the absorption was negligible. The iron was at first largely transported by the plasma, but within a few hours it started to concentrate in the red blood cells and within three days about 7 per cent of the tagged iron was found to be present in the erythrocytes presumably as hemoglobin.

In another series of experiments, it was found that no matter how great a surplus of labelled iron was injected, the dogs had no ability to excrete this material. At present the author is studying whether the iron which appears in the erythrocytes as early as five hours following feeding is already in the form of hemoglobin or in some other combination.

Other examples of radioactive element work may be successfully utilized, tracers in biological research are also briefly reviewed. A listing of these radio-indicators according to the case in which they may be employed gives the following table:

RADIO-INDICATORS

Element	Half Life	Metabolism	Radiating Partic
Phosphorus	43 days	Sulfur	Neutron
Arsenic	4	Phosphorus	Deuteron
Sodium	4 hours	Germanium	Proton
Iodine	8 hours and 8 days	Sodium	Deuteron
Selenium	40 days	Iodine	Deuteron
Potassium	3 hours	Tellurium	Proton
Copper	3 days	Arsenic	
Iron	84 minutes	Potassium	Deuteron
Sulfur		Copper	
Fluorine		Iron	
Chlorine		Sulfur	
Carbon		Oxygen	Proton
		Chlorine	Deuteron
		Boron	

T. LEVITSKY, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 72

FEBRUARY, 1941

NUMBER 2

PRINCIPLES OF SURGICAL PRACTICE

THE PATHOLOGICAL CONSIDERATIONS RELATING TO THE EARLY DIAGNOSIS AND CURATIVE SURGICAL TREATMENT OF CARCINOMA OF THE ESOPHAGUS

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THE recent revival of interest in the surgical treatment of esophageal carcinoma is both timely and deserving. Its importance is more fully appreciated in view of the fact that it is fourth in frequency of all malignant tumors occurring in men over twenty years of age. In a survey compiling 124,827 autopsies from 42 German pathological institutions between 1925 and 1933, Dormanns found it was surpassed in frequency only by cancer of the stomach, lung, and rectum. Of 23,139 deaths due to malignancy in patients more than twenty years of age, 8 per cent were due to this tumor.

Until recent years, the mortality of this condition was practically 100 per cent. Surgical and x-ray treatment alike had met with almost complete failure, Torek's successful resection being the only case in which the patient survived for more than five years. Experimental investigation had suggested methods of surgical attack but successful clinical application was long delayed. In this respect, lack of early correct diagnosis played a major rôle. However, the rapid development of thoracic surgery has been very important in the recent successful surgical treatment and the revival of general interest in this disease. That this interest is increasing is demonstrated by reports of continued success in its surgical management. This should be encouraged, for only in this way can real progress be effected.

The reasons for this lesion resisting successful treatment until recent years are threefold:

- 1 The lack of early correct diagnosis
- 2 The poor results from x-ray therapy
- 3 The high mortality of operative treatment

The first two of these are influenced fundamentally by the pathological characteristics of the tumor, the third primarily by the delayed development of intrathoracic surgery.

THE INFLUENCE OF PATHOLOGICAL ANATOMY AND PHYSIOLOGY ON THE CLINICAL COURSE

The symptoms of this malady are brought about by

- 1 Mechanical obstruction of the passageway by the tumor
- 2 Influence of the tumor on the adjacent structures
- 3 Metastatic lesions

Although not typical for this condition, dysphagia is the most outstanding symptom in the majority of cases. The location of the tumor makes little difference in this respect except in the interval between the act of swallowing and the experiencing of a sense of obstruction. By far the majority of the tumors are located in the middle and lower segments of the organ, only 10 per cent occurring in the upper part.

CLASSIFICATION OF TUMORS

The gross appearance of these tumors varies somewhat, and three principal forms are recog-

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nized, viz. scirrhus, medullary and papillary. These gross characteristics influence to some degree the symptoms produced by the tumor. This classification bears no relation to the histological nature of the tumor, the majority (95 per cent) of which are of the squamous-cell variety. All other cell types (adenocarcinoma, basal-cell carcinoma) are usually located in the lower portion of the esophagus.

Scirrhus carcinoma. Early in its course this type consists of a thickening of the wall of the esophagus which forms a nodule or tubercle. Extension early is in the circumferential direction, later in the longitudinal direction. Through its circular growth there results a narrowing of the lumen to a marked degree, the length of which is determined by its longitudinal extension. The segment of the organ involved may be quite short unless measures are taken to relieve the obstructive symptoms caused by the extreme degree of stenosis of the lumen.

The mucosa overlying the scirrhus type may remain relatively little involved for weeks or months. Thus on esophagoscopy no ulcerating surface is visible and a biopsy of superficial tissue is apt to show no evidence of tumor. This must be kept in mind in the differential diagnosis of stenosing lesions of this organ. Later the characteristics of a malignant tumor appear with the development of irregular borders and a crater-like destruction in the central portion.

Medullary carcinoma. This type usually becomes much larger than the scirrhus, since it ulcerates much earlier and because of this does not lead to as high a grade of stenosis. The whitish, often friable decomposing tumor develops a very irregular mucous membrane surface and may present a cauliflower-like appearance. This type may become as large as the palm of the hand.

Papillary carcinoma. In this form marked cauliflower-like development is seen usually with a foul central necrosis. Less often, pedunculated growths are present and are attached by a broad base.

INFLUENCE ON ADJACENT STRUCTURES

Because of its close proximity to other important structures, complications caused by direct extension of the tumor are common (about 50 per cent). The first symptoms noted may be from this source, a fact which partially accounts for the variability of the clinical course.

Tumors located near the lower end of the esophagus may invade the wall of the stomach and be confused with carcinoma of that organ. Perforations of the respiratory tract by the lesion with resultant infection is of common occurrence. This

perforation may involve the trachea near its bifurcation, the primary bronchi or the parenchyma of the lung. The order of frequency of involvement by direct extension found at autopsy is about as follows: lung parenchyma, 13 per cent; trachea, 5.5 per cent; primary bronchi (usually left), 4.5 per cent; pleura, 3.3 per cent; mediastinum, pericardium, blood vessels, and nerves. Erosion of the wall of the aorta or its branches with sudden exodus by hemorrhage may occur. Involvement of the recurrent laryngeal nerve, especially the left and of the sympathetic nerves produces symptoms and findings of disturbed functions of these structures.

METASTASES

In addition to the direct influence of the tumor on the wall of the esophagus and neighboring structures, metastases by way of the lymph and blood stream are of primary importance. Extension of the tumor in this manner is quite variable, since Dornmann in the statistics already referred to (1,679 cases of carcinoma of the esophagus) reported the absence of distant metastases in 40 per cent of the cases. (This is explained by the slow advancement of the tumor by direct extension and by the inhibiting action of regional lymph nodes.) Spread by way of the lymphatics is most frequent, the lymph flow of the upper two thirds of the organ being toward the mediastinal, bronchial and supraclavicular lymph glands, while that of the lower esophagus is directed toward the cardiac glands along the lesser curvature of the stomach. Distant metastases most frequently involve the lung and pleura (51 per cent) and liver (6 per cent) and to much lesser extent the kidney, stomach, pancreas, thyroid, peritoneum, and mesentery. Metastases have been reported in almost every organ or structure of the body. Very commonly these secondary growths remain silent, and undoubtedly are overlooked or are not readily demonstrable at operation or autopsy. In spite of the lack of symptoms directed toward these distant secondary growths, it is very doubtful that carcinoma of the esophagus remains confined to its primary location for a long time before metastases occur. This is particularly the case regarding the regional lymph glands. Hoernemann and Eberhardt from their own experience with 18 cases and from recent reports believe that at least 50 per cent of the patients already have metastases when first observed. In their cases this belief was substantiated by roentgenograms of the lungs or at operation. Of 73 necropsies 47 or 65 per cent, revealed metastatic lesions outside of the regional lymph nodes. This

concurs with Dormann's report of 60 per cent involvement in a much larger series of cases. In these cases, however, the duration of symptoms when the patient is first seen is of great importance. The average duration of life expectancy following the onset of symptoms is between five and eight-tenths and eight and two-tenths months. This is very little influenced by the age of the patient or by the location and type of tumor. Since these statistics on the incidence of distant metastases were gathered from necropsy material, it is not unlikely that the percentage would be much lower during the early course of the disease, a factor of great importance when surgical treatment is considered.

The following cases illustrate many of the features which have been mentioned and emphasize their importance in a consideration of the diagnosis and surgical treatment of this tumor.

CASE 1. H. H., a white male aged seventy, complained of difficulty in swallowing and loss of 20 lb in weight during the month preceding admission. Some pain was experienced behind the sternum on swallowing solid food for three months before admission. The symptoms gradually became worse and solid food began to "stick" and not go down. He would have a choking sensation, and regurgitate food recently swallowed. When first seen he experienced no trouble swallowing liquids. Physical examination revealed a somewhat emaciated individual, but otherwise no abnormalities other than a small degree of dehydration of the tissues. Laboratory findings showed the red blood count to be 3,710,000, the albumen, 1 plus, and the blood Wassermann test, 4 plus.

An x-ray examination following the ingestion of a small amount of barium revealed an obstructive lesion at the junction of the lower and middle third of the esophagus, and extending downward from 8 to 10 cm. There was dilatation of the esophagus above the point of obstruction, and a suggestion of a central crater within the tumor mass.

Esophagoscopy revealed considerable food lying just above the point of obstruction. The mucosa presented a granular, irregular, friable mass which bled easily. A biopsy revealed the tumor to be a squamous-cell carcinoma.

An exploratory thoracotomy was performed through the left chest wall. A hard swelling of the esophagus was found to begin 1 in. above the diaphragm and to extend 3 in. upward. The tumor had invaded the lung and the anterior surface of the aorta by direct extension. There were also two nodules in the posterior mediastinum which were adherent to the lung margin. The tumor was considered inoperable. The chest wall was closed and a gastrostomy performed.

The final diagnosis was squamous-cell carcinoma of the medullary type involving the lower third of the esophagus, with involvement of the lung and aorta by direct extension, and with metastases to the posterior mediastinum.

CASE 2. J. M., a white male aged sixty-four, complained of dysphagia with regurgitation of food for eight months. The patient's first trouble began with the swallowing of buckwheat grits, which "stuck" in the lower chest after swallowing. This symptom occurred off and on for five months, after which time it became continuous and he could swallow only soft foods or liquids. He received 26 x-ray treatments but with no relief. He lost much strength

and about 20 lb in weight. There was no history of tarry stools or hematemesis.

A physical examination revealed a markedly emaciated patient, but there were no other definitely abnormal findings. Laboratory tests were normal.

Fluoroscopic and x-ray examination following the ingestion of barium revealed a high degree of stenosis of the lumen of the esophagus from an obstructive lesion at its lower end. Polypoid lesions here replaced the normal rugae. There was some dilatation of the lumen above the obstructive lesion. A differential diagnosis between carcinoma of the stomach and of the lower end of the esophagus could not be definitely established. Since there was no evidence of distal metastases, an exploration was advised. This was performed through the abdominal wall, and a hard immovable tumor mass was found, which involved the cardiac end of the stomach and extended upward into the esophagus. Regional lymph nodes and the liver revealed evidences of metastases, the lesion thus being inoperable. A gastrostomy was performed. The final diagnosis was carcinoma of the cardiac end of the stomach and involvement of the lower end of the esophagus by direct extension, with metastases to the regional lymph nodes and liver.

CASE 3. J. L., a white male, sixty-four years of age, complained of dysphagia beginning three months before admission. At its onset, discomfort was produced only by the ingestion of solid food. His condition gradually became worse, and during the two weeks before admission, difficulty was experienced on swallowing liquids and regurgitation occurred immediately following deglutition. There was no history of hematemesis or pain (except discomfort attending the act of swallowing). Since the patient had been on a milk diet, he had become constipated. He had lost 40 lb in the three months prior to admission (196 to 156), and experienced a marked loss of strength. He had received five x-ray treatments two months prior to admission, with out benefit.

A physical examination revealed a chronically ill appearing man who was poorly nourished and somewhat dehydrated. Other than an emphysema of the lungs, no other abnormality was found. Laboratory tests were normal.

A roentgenogram of the esophagus following the ingestion of barium revealed a high grade of obstruction caused by a lesion located just above the diaphragm. There was a small amount of dilatation immediately above the point of obstruction.

Esophagoscopy revealed a nodular friable mass which bled easily and almost completely obstructed the lower end of the lumen. A biopsy exhibited a squamous-cell carcinoma of the esophagus.

Since there was no evidence of spread of the tumor, an exploratory laparotomy and gastrostomy was performed. Two weeks later the tumor was examined through a thoracotomy opening. A hard mass involving the esophagus over a distance of 5 cm., extending upward from a point 1½ in. above the diaphragm, was found. It was densely adherent to the soft structures anterior to the bodies of the vertebrae. Through an opening made in the diaphragm, two suspicious-appearing lymph nodes located at the cardiac end of the stomach were removed. The tumor was freed from the vertebrae care being taken to include as much of the posterior adjacent tissue as possible. The esophagus was brought out through a separate incision at the base of the neck anteriorly, following the closure of the wound in the thorax. The convalescence which followed was uneventful. The final diagnosis was carcinoma of the lower third of the esophagus with involvement of the posterior adjacent tissue by direct extension, and with metastases to the cardiac lymph nodes at the lesser curvature of the stomach. A resection of the entire thoracic

string suture. The upper end of the esophagus is brought out through a stab wound in the neck, thus producing a fistula of the cervical esophagus. This is later connected to a gastrostomy opening by means of rubber and glass tubing. This type of procedure may be used in all cases of carcinoma of the esophagus, the report of the first successful case being made by Torek. Most of the early successful resections performed in the United States and in Europe have been of this type.

2. This type consists of the resection of a segment of the lower esophagus, following which the fundus of the stomach is brought up into the thorax through an opening made in the diaphragm, and an end-to-side anastomosis made with the upper cut end of the esophagus. In this way a reestablishment of the alimentary tract is effected following the resection of the tumor. This second type of operation can be employed only when the tumor is located far enough below the arch of the aorta to enable the suturing of the stomach to the cut end of the esophagus. When possible, the second type of operation is probably more satisfactory since it allows the ingestion of food in the customary way without necessitating constant attention to esophagostomy and gastrostomy wounds. On the other hand, patients may live in comparative comfort for many years with an artificial esophagus made of rubber and glass tubing. In either type of operation, attention must be given to direct extension of the tumor as well as to metastatic lesions. All suspicious tissue in the neighborhood of the tumor should be excised. Whether the first or the second type of operation is employed the diaphragm should be opened through the thoracic approach and all suspicious

glands in the region of the cardia removed. The apophes also to the mediastinal lymph nodes.

Postoperative management. A blood transfusion should always be given during the operation and further transfusions may be indicated during convalescence. Supportive measures including nourishment by intravenous and subcutaneous administration not only will insure sufficient caloric intake, but will maintain water and mineral balance. Obliteration of surgical pneumothorax and elimination of serosanguineous exudate by continuous low-grade suction will help to prevent infection and will aid materially in obtaining primary healing.

SUMMARY

The frequency of carcinoma of the esophagus has only recently become appreciated. That it is a very common tumor is indicated by the fact that it ranks fourth in incidence of all malignant tumors in men over twenty years of age. Thus, it presents one of the major problems in tumor therapy. Treatment of this condition has met with almost complete failure until recent years. Successful operative management is gradually increasing. Progress in successful surgical management depends almost entirely on early diagnosis. Inasmuch as these tumors remain silent until mechanical obstruction of the lumen occurs, early diagnosis is difficult. It is not until the profession as a whole becomes well aware of these facts, and is on the lookout for the earliest symptoms, that much progress will be made. Education of the public regarding tumors in general has had considerable influence, and with further effort, more may be expected.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Sugar, H S Concerning the Chamber Angle I
Gonioscopy *Am J Ophth*, 1940, 23 853

Notwithstanding the important pioneer studies of the angle of the anterior chamber, made during the past thirty seven years, it has remained for Barkan, with his newer methods of gonioscopy, to create a practical interest in this phase of ophthalmology. With the awakening has come a demand for more precise knowledge of the technique, anatomical interpretation, and practical application of this method of examination.

From his studies and observations on 102 cases, the author concludes:

- 1 The normal angle of the anterior chamber has definitely recognizable characteristics, which depend to some extent on the color of the iris. When trabecular pigment is present, its source is always the pigment epithelium of the iris. Its relation to glaucoma is still an unclarified point.

- 2 Gonioscopy is an important adjunct to thorough ophthalmic examination. It is of particular value in studying anomalies, neoplasms, cysts, and the results of trauma involving the angle. Perhaps most important is its use in studying postoperative glaucoma, particularly in determining the reasons for surgical failure.

- 3 Peripheral anterior synechiae are present in a large number of eyes operated upon to relieve glaucoma. These add to the embarrassment of previous drainage channels but are significant only when the new surgically formed channels are inadequate. They must be considered in contemplating secondary surgery.

- 4 Peripheral anterior synechiae are not present in early and even moderately advanced compensated cases of glaucoma which have never been incompen-
sated at any time. They occur only late in the glaucomatous process, probably beginning with edema of the ciliary body during an episode of incompen-
sation.

LESLIE L. MCCOY, M D

Lijó Pavía, J Initial Lesions of the Macula Observed with Sodium Light (Lesiones iniciales de la mácula observadas con la luz de sodio) *Rev oto-neuro-oftalmol y de ciruj. neurol. sud americana*, 1940, 15 235

Lijó Pavía states that examination of the macula with the sodium light reveals slight changes even before the patient has experienced subjectively the slightest decrease in vision. He presents 4 observations in which the small size of the lesions (a few tenths of a millimeter) has at times made it very difficult to obtain their photographic reproduction.

In a case of mental overwork with vision corrected to normal, examination of the macula with ordinary light showed that its limiting reflection was irregular and that it contained numerous brilliant points, especially in the left eye, the foveal reflection was dissociated although the dark red spot of the fovea could be distinguished clearly. With sodium light, the macular reflection was slightly irregular and the presence of cholesterol dots could just be seen on its temporal border. The macular region gave the impression that its internal limiting border presented an interruption in front of the fovea and that the border of the latter was marked by a series of small yellowish white, brilliant spots, between these appeared the foveal reflection, which was very brilliant, reversed, and of a size ten times larger than the afore mentioned spots. More spots of the same type were seen in the remainder of the macular region.

In another case in which the subject was experiencing subjectively a decrease of vision in the left eye, examination with ordinary light showed that the border of the papilla was nearly completely blurred, and that the macula was deformed and interrupted in its nasal sector. The interior of the macula seemed to be granular and presented a greenish gray spot, no foveal reflection could be observed. One year later, vision had improved slightly under treatment. Examination with sodium light revealed improvement in the temporal sector of the papilla and thickened nerve fibers in the papillomacular region, which formed folds which ran from the nasal sector of the macula to the temporal border of the papilla. The macula presented a special aspect, and a dark patch in its center allowed distinguishing of the fovea and also of the foveola. In the outer part of the macula, the reflection was more or less marked above, below, and in the temporal sector, but disappeared in the nasal sector where it was replaced by a slightly depressed and dark section limited centrally by a circle of reflection which was also incomplete in the nasal sector. The middle part of the macula, included between the internal circle of reflection and the fovea, showed numerous very small vacuoles. The greenish-gray spot in the outer part of the macula could not be seen with this light, but became visible with infra-red light and retrograde transillumination.

In an old patient with hepatic disease and subjective changes in vision, which were more marked in the left eye, examination with ordinary light showed a slight macular reflection and a fovea just visible as a pink, slightly dark zone, the center of which presented a circular loss of substance with a brilliant border which was reached by the horizontally enlarged foveal reflection. Below and inter-

nally a cholesterol nodule the size of a large vessel, and above and externally two spots could be observed. Sodium light showed that the macula and fovea were barely marked. The three nodules and the perforation were just visible because the slight foveal, very granular reflection was caught by what appeared as a brilliant border under ordinary light. The area of the perforation was marked by a small, more obscure zone at the bottom of which whitish spot could be seen with difficulty. The nodule was clearly visible.

RICHARD KERR, M.D.

EAR

LITTLE, H. I. The Treatment of Otitis Media. *J. Am. M. Ass.* 940, 3 506

Assuming that the diagnosis of acute otitis is made correctly, what should be done? The patient should be hospitalized and confined to bed in a nearly upright position. The room should be warm and moist. Appropriate treatment of any respiratory infection should be instituted and it must be insisted that the patient not blow th nose. Hot moist dressings applied over the ear and mastoid are effective in ameliorating symptoms. Rontgenological treatment of the ear in the early stages of the condition has been found to afford considerable relief of pain for many patients.

There seems to be no unanimity of opinion regarding the indications for and usage of myringotomy in suppurative otitis media. If myringotomy is deferred, any of the standard medicaments may be used in the ear. In addition to the effect it has on the pain, the use of medicament helps partially to sterilize the canal. During this period other necessary examinations may be carried out. If myringotomy is decided on as a primary method of treatment, the operation is best performed under general anesthesia. An adequate incision of the tympanic membrane, not merely a puncture wound, should be insisted on.

It is my opinion that it is best not to resort to irrigations of the auditory canal if the discharge from the ear is free. Irrigation of the auditory canal should not be done until the discharge becomes thick and purulent. Hot moist compresses should be applied over the ear and the mastoid process because their use seems to encourage free discharge.

Careful observation of the body temperature, pulse, and respiration, and the use of laboratory tests are essential because the progress of the patient may best be followed if these observations are correlated.

The use of sulfanilamide is rather general at present, and the literature is filled with strikingly successful instances of its use. On the other hand, it is equally true that warnings are being sounded by very competent observers to the effect that the use of the drug may seriously mask the signs and symptoms of actual underlying pathological processes.

In general, it can be said that the treatment of chronic suppurative otitis media should be carried out by an otologist. The frequency of treatment is

entirely dependent on the nature of the disease. Treatment must be persistent, well directed, and meticulous. To wash out the discharge with aqueous solutions is not good treatment; the use of alcoholic solutions is preferable. Manipulation with instruments may be necessary to remove collections of desquamated material, a small polyp causing obstruction to underlying cavities or recesses, and exuberant granulation tissue. At the first visit of the patient it may not be possible for the otologist to do all he would like to do because the patient may be too apprehensive. As confidence is gained, more can be accomplished. From an economic standpoint, persistence in local treatment may be favorable from the patient's point of view. If the treatment is not entirely successful and surgical intervention is decided on, it will be found that the local treatment has prepared the field well and that the period of postoperative treatment will be much less prolonged for that reason. Treatment at home under the direction of the otologist is not effective until the pathological process has been brought well under control.

Patients affected with chronic suppurative otitis may be divided clinically into four groups. The clinical management of each group is based on the recognition of the underlying pathological process.

NOSE AND SINUSES

BRUNNER, H., and WALL, J. W. Carcinomatosis of the Nasal Mucous Membrane (Fatal Hemorrhage After Puncture of the Maxillary Sinus). *Ann. Otol. Rhinol. & Laryngol.*, 940, 49, 685.

The case which the authors describe presents metastatic malignancy of the nasal mucous membrane, but without the development of tumor like formation. A fifty-four-year-old white male, puncture of the right antrum was made under the inferior turbinate and a small amount of pus, with considerable bleeding, was obtained. The extreme pallor of the patient, who had given a history of back pains, in addition to the "butter-like" consistency of the nasal wall felt at puncture convinced the authors that they were dealing either with a carcinoma and multiple metastases in the skeleton, or with myeloma.

Following puncture there was a small amount of bleeding. This was controlled by a nasal pack. The same afternoon severe epistaxis occurred, but this again was controlled. The patient, however, showed signs of internal bleeding and began to vomit large amounts of fresh blood. Repeated nasal examinations exonerated the nose as the specific offender. Despite two blood transfusions, the patient died the following morning, about twenty-four hours after puncture of the antrum. An autopsy was performed and the anatomical diagnosis was diffuse carcinoma of the lesser curvature of the stomach with metastases to the liver, regional lymph nodes, meninges, and calvaria; hemorrhage from carcinoma of the stomach; right suppurative maxillary sinusitis; bilateral patch telecystitis of the lungs; and an old

healed tuberculosis of the apices of the lungs. Gross examination of the head revealed an area of softening in the inner table of the parietal bones, and a partial clotting of the venous sinuses of the dura.

In the microscopic examination, carcinoma cells were found within the blood vessels of the nasal mucous membrane, onkocyte cells were observed in the nasal glands, but the most outstanding feature was the finding of emboli within the veins and lymph vessels of the nasal mucous membrane, consisting of cells with large nuclei and somewhat irregular margins of their protoplasm. Finally, the authors believe that they can explain the gastric hemorrhage thus the antrum puncture and irrigation caused an irritation to the mucous membrane of the antrum, which in turn reflexly caused some disturbance in the circulation. This circulatory change forced too great a load on the blood vessels of the tumor in the stomach, which already were weakened by the tumor, and they ruptured, causing the hemorrhage and subsequent death of the patient.

NOAH D. FABRICANT, M.D.

MOUTH

Kohn, S. I. Facial Fistulas of Dental Origin. *Am J Orthodont & Oral Surg*, 1940, 26: 797

An external fistula may result from an apical abscess or cyst of a tooth. The true nature of these fistulas is frequently not recognized, the proper care of the condition requires the cooperation of the physician and dentist.

The appearance of these fistulas may not be preceded by any particular pain or discomfort, but on the other hand swelling and pain may be great.

Judicious packs and hot saline mouth washes may prevent rupture of the abscess externally, intra oral drainage of the abscess is desirable. However, if the abscess points externally, incision below the mandible is desirable, as the scar is less noticeable.

Should a fistula develop after the acute infection has subsided, the affected tooth should be removed and the granulations gently curetted. This usually results in prompt closure of the external sinus.

LUTHER H. WOLFF, M.D.

Martin, H. E., Munster, H., and Sugarbaker, E. Cancer of the Tongue. *Arch Surg*, 1940, 41: 888

A series of 556 consecutive unselected cases of cancer of the tongue have been subjected to intensive clinical analysis and report. At the Memorial Hospital cancer of the tongue comprises about 15 per cent of all tumors of the upper respiratory and alimentary tracts and about 25 per cent of all intra-oral tumors. In the series herein reported, the average age of the patients was about fifty-eight years at the time of admission to the hospital. Eighty-seven per cent of the patients were males and 13 per cent were females. There is general agreement that the most frequent site of origin is the edge of the tongue in its middle third (50 per cent in the authors' series).

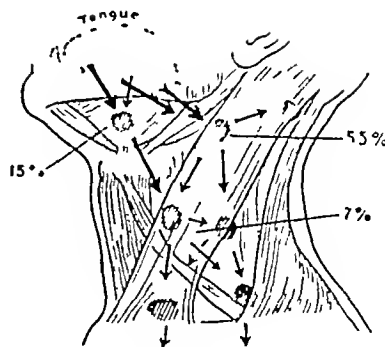


Fig. 1 Pathways of metastasis in cancer of the tongue. The figures express the frequency of initial involvement in certain areas.

Such characteristic signs of chronic irritation in the oral cavity as leucoplakia, chronic glossitis, and dental sepsis are much more prevalent in the male than in the female. The fact that cancer of the oral cavity is likewise more frequently found in the male is one of several evidences of a direct causal relationship between chronic irritation and intra oral cancer. Undoubtedly the chronicity of the irritant is more important than its nature.

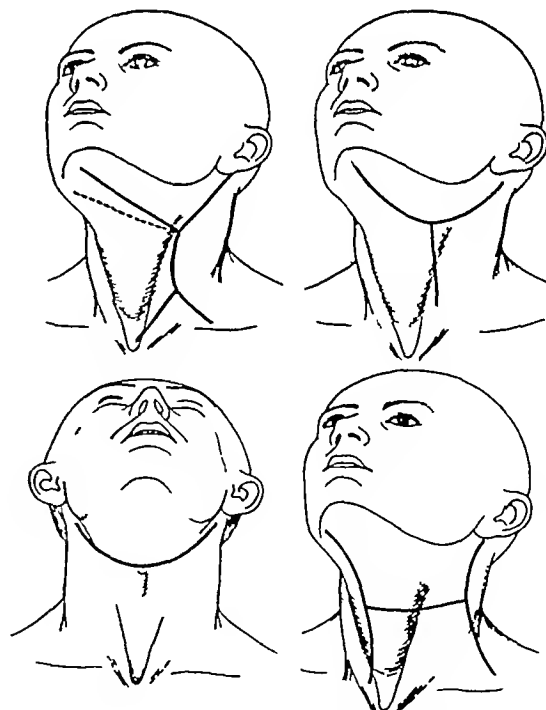


Fig. 2 The most useful forms of incision for neck dissection.

Differentiating, keratinizing squamous carcinomas and relatively non-keratinizing mucous membrane types of epidermoid carcinoma comprise about 90 per cent of the malignant tumors of the tongue which occur anterior to the circumvallate papillae. About 80 per cent of carcinomas of the base of the tongue are of the non-keratinizing variety and in this region anaplastic tumors occur in larger proportion. Transitional cell carcinomas and lymphoepitheliomas comprise about 20 per cent of the tumors at the base.

In the majority of instances the patient discovers the lesion by the tactile and visual senses alone and not because of any actual discomfort. Other first symptoms, in the order of their frequency, are as follows: the development of palpable cervical nodes, hoarseness, dysphagia, dyspnea (when the base of the tongue is involved) and pain, tenderness, or irritation ascribed to sharp teeth or ill-fitting dental plates. A cancer at the base of the tongue may ulcerate and reach a size of 3 cm. or even more without causing any particular noticeable local symptoms.

In the series of cancers of the tongue reported here the incidence of metastases on dissection was about 30 per cent. The group of lymph nodes earliest and most frequently involved is the upper deep cervical (55 per cent) which is centered about at the bifurcation of the common carotid artery (Fig. 1). Dissemination below the clavicle to the viscera or other soft parts and to bone is far more frequent in cancer of the tongue than in cancer of the lip or cheek. Visceral metastases are particularly likely to follow growths of the base of the tongue where anaplastic tumors are common.

About 30 per cent of all cancers of the base of the tongue in the clinic at the Memorial Hospital are referred because of cervical lymphadenopathy with the primary lesion undiscovered. It should be remembered that most cervical adenopathies in the adult are malignant and probably metastatic from cancer primary in the oral cavity or in the oral and nasal pharynxes.

In case of chronic ulcer of the tongue, a positive Wassermann reaction does not disprove the presence of cancer since syphilis and cancer of the tongue coexist in about one-third of all cases. Since gumma of the tongue is rare (the incidence is less than 1 per cent of that of cancer of the tongue) it seems illogical to employ the therapeutic test without first making a biopsy. It is certainly unwise to persist in the therapeutic test for longer than three weeks. The relative frequencies of cancer, tuberculous ulcers, and gumma of the tongue according to the admission records of the Memorial Hospital, are about 100, 3 and less than 1 respectively. A diagnosis of tuberculous ulcer is made with the aid of biopsy (preferably repeated), a roentgenogram of the chest, and examination of the sputum. A correct diagnosis is especially important, since the proper treatment for cancer is almost the worst possible treatment for tuberculosis, and vice versa.

It is unfortunate that the current medical literature should still contain reports attempting to prove the superiority of one method alone—either radiation or surgical therapy—in the treatment of cancer of the tongue. In the treatment of cancer of the tongue, three distinct problems must be considered: (1) the hygienic care of the oral cavity before and during treatment; (2) the treatment of the primary lesion; and (3) the treatment of cervical metastases.

Among the general hygienic measures, proper dental care, irrigations of the oral cavity with mildly alkaline saline solutions, nasal feedings, vitamin therapy (especially B and C) and the administration of liver extract, either personally or intravenously must be mentioned.

Methods of treatment used at the Memorial Hospital for the primary cancer of the tongue are:

A. Radon seeds alone for very small early lesions.
B. Fractionated external roentgen irradiation supplemented by radon seeds—the most useful method for all except the very small growths of the anterior two-thirds of the tongue.

C. Fractionated roentgen irradiation through the neck followed by supplementary radon seeds for cancer of the base of the tongue.

D. Radon seeds ("overdosage") followed in from five to ten days by partial glossectomy. This method is indicated only for limited number of bulky fungating, partly necrotic tumors.

E. Variations in technique:

1. Roentgen irradiation alone. This may be successful with limited number of very radiosensitive tumors. Supplementary interstitial irradiation is probably indicated in all cases.

2. Low voltage, lightly filtered external roentgen irradiation. This form of treatment should be limited to the very superficial growths on the anterior portion and dorsum of the tongue.

3. Surgical excision alone without either preliminary or postoperative irradiation. This procedure has a very small field of usefulness and should be limited to the fungating papillary tumors at the tip of the tongue.

Methods of treatment used at the Memorial Hospital for cervical metastases are as follows:

Protracted external irradiation through small portals followed by the implantation of radon seeds. This method is the most generally useful for treatment of all cervical metastatic cancer.

Radical neck dissection (Fig. 2). This method has limited application but is very useful when indicated.

3. Radon seeds alone. This method is indicated only for very small or isolated nodes.

4. External irradiation alone. This method is useful only in very radiosensitive tumors.

5. Variations and combinations of technique:
A. Surgical exposure and implantation of radon seeds.

B. Implantation of radon seeds in heavy dosage followed in from ten to fifteen days by surgical excision.

C Surgical excision followed by radon-seed implantation for an irremovable residuum

The complications following surgical procedures are apt to be acute and severe but of short duration, those following radiation treatment tend to be of lesser degree (at least in the beginning) but of longer duration. Radionecrosis of limited extent may often be dealt with by local conservative measures, such as mouth washes, irrigations, sprays, and the daily removal of the slough, but in the case of persistent or widespread involvement convalescence is shortened by partial glossectomy, in which the devitalized area with fair margins of viable tissue surrounding it should be removed. In all hemorrhages from cancer of the tongue, prompt ligation of the vessels of the neck is indicated. The blood supply of the anterior portion of the tongue is derived from the lingual artery, with the addition of the tonsillar branch of the facial artery (external maxillary) which in part supplies the base. It is usually recommended in surgical texts that all of these vessels be approached by an incision through the submaxillary triangle, but the authors believe that they are best exposed for ligation at the bifurcation of the common carotid artery, which lies under the anterior edge of the sternomastoid muscle, a little below the level of the angle of the jaw. Radio-osteomyelitis of the jaw should be treated conservatively, at least until the probable extent of the sequestration can be determined. The complication is less serious in the upper jaw than in the lower. Partial resection of the mandible may be necessary in cases of aggravated lesions.

JOSEPH K. NARAT, M.D.

PHARYNX

Figl, F. A. *Fibromas of the Nasopharynx* *J. Am. M. Ass.*, 1940, 115 665

From January 1, 1910, to January 1, 1940, 63 patients having fibromas of the nasopharynx have been examined at the Mayo Clinic. The entire group of 63 includes only patients who had fibromas of the juvenile basal type. Fifty-eight of the tumors occurred in male patients, 5 in female patients. The patients ranged in age from ten to thirty-one years at the time of examination.

Data concerning some of the patients encountered prior to 1919 were incomplete and because of this only 45 cases, in which the patients were seen since that date, were reviewed in detail.

The extent of these tumors varies greatly. Although they usually spring from some point of origin situated high on the posterior wall or the vault of the nasopharynx, in our experience comparatively few of them were limited to this cavity at the time the patient reported for examination. The inherent activity of the growth, together with the stimulation induced by repeated incomplete treatment previously carried out in the majority of these cases, unquestionably was a factor in such extension beyond the aforementioned cavity. The nasopharynx was involved in all 45 cases in this series which were

studied in detail, but in only 11 cases were the tumors confined to this region alone. Both nasal fossae were involved in 3 cases, the left alone in 18 instances and the right in 13.

Removal of tissue from these tumors is always attended by profuse bleeding and in some of the more recent instances of the condition biopsy was not performed, the diagnosis being based on the history, the age of the patient, the hardness of the tumor, and the characteristic clinical picture. Surgical removal of these tumors involves considerable risk, and recurrences are frequent. The implantation of radium and electrocoagulation supplemented with radium are the most effective forms of treatment in these cases. By means of electrocoagulation and the insertion of radium a tumor of this type can at times be eradicated with a single application, but fewer complications are likely to be encountered if treatment is carried out in stages. There was no mortality in the series. All the patients who received complete therapy are now well with the exception of 1 male patient, sixteen years of age, who is still receiving treatment at the time of writing.

NECK

Niño, F. L. *Papilliferous Cystadenolymphomas of the Neck* (Cistoadenolinomas papilíferos del cuello) *Boletín de clin. quir.*, Univ. de Buenos Aires, 1940, 16 271

The author has been director of the Laboratory of the Chirurgical Institute of the University of Buenos Aires for eleven years. During that time he has had occasion to examine 6 cases of papilliferous cystadenolymphoma of the parotid region, all of which are described in detail in this article and illustrated with reproductions of the histological findings. Previous to this publication only 18 cases of this form of tumor have been described in Argentina. This doubtless does not represent the entire number that have occurred, for many have probably not been published.

Among the 86,000 patients examined in this Institute only 70 had tumors of the parotid glands which were studied histologically. Eleven of these were cystic tumors and of these 7 were papilliferous cystadenolymphomas, therefore, this form of tumor constitutes 10 per cent of the total number of parotid tumors.

In the first of the author's cases the tumor was bilateral. So far as he knows this is the only case in the world literature in which this form of tumor was bilateral.

Very little is known of the pathogenesis of this form of tumor. The author discusses the different theories held in regard to it and says that he is inclined to think that these tumors are embryological in origin. He uses the name papilliferous cystadenolymphoma because it describes the histological picture of the tumors very accurately.

AUDREY G. MORGAN, M.D.

Gross, R. E., and Connery M. L.: Thyroglossal Cysts and Sinuses. *New England J. Med.*, 940, 366.

The authors review the findings in 108 cases of thyroglossal cysts and sinuses observed or treated at the Children's Hospital of the Harvard Medical School, Boston.

Thyroglossal cysts and sinuses are usually lined by columnar or ciliated epithelium, but the epithelium may be squamous in type. Not uncommonly there are small slit-like or irregularly branched side pockets extending from the sinuses for several millimeters into the surrounding tissue. The cysts and sinuses contain varying amounts of mucoid material unless lined by squamous cells when they contain yellow grumous or pasty material. Varying degrees of acute and chronic inflammation are found in the wall.

Study of the soft tissues and central portion of the hyoid bone removed by block dissection makes it clear that in order to be certain that the entire tract is removed, block of tissue as far upward as the foramen cecum and including the central portion of the hyoid bone must be removed.

Approximately 85 per cent of the cases studied were cysts and about 15 per cent were sinuses. In few cases there was deep cyst communicating with a superficial sinus which did or did not connect the cyst with the skin.

A thyroglossal cyst may be found anywhere in the midline cervical structures from the base of the tongue downward to the suprasternal notch. Almost invariably there is some deep attachment to the structures in the base of the mouth or to the underlying hyoid bone. In rare cases pressure on the cyst will express small amount of fluid at the base of the tongue.

Thyroglossal-duct sinuses open in the midline anywhere from the suprasternal notch upward to position just in front of the hyoid bone. In most cases careful palpation of the neck will reveal a cord of tissue running upward in the deep structures of the neck.

In 39 per cent of the patients the lesions were noted at birth and in 76 per cent the symptoms began before the sixth year. Fifty-six per cent of the patients were girls and forty-four per cent boys.

The authors give the differential diagnosis of thyroglossal cysts and sinuses. They do not believe all cases require operation. They do not believe that the use of sclerosing solutions is the proper method of treatment. Acutely inflamed cysts should not be excised.

The technique of operation for cyst or sinus is as follows:

The head should be extended. A transverse incision should always be used, care being taken to have it fall in the neck fold. The tract should be dissected to the hyoid bone. A cm. of the midportion of the hyoid bone is removed, and the block dissection is continued up to the base of the tongue. A forefinger passed into the mouth and pressing in the re-

gion of the foramen cecum will guide to the depth of the dissection.

Ninety-one cases were treated by the complete operative procedure including removal of the middle of the hyoid bone. None of these cases have had recurrence. In 16 cases incomplete operative procedures were done with 50 per cent recurrence. Six of the 8 patients with recurrence were subjected to secondary or tertiary procedures before final cure was obtained. The 3 patients with exposed mucous membrane in the midline did not get good cosmetic results and therefore the authors recommend surgery plus postoperative x-ray therapy in these cases.

EARL O. LATHROP, M.D.

Tejerina Forthingham, W. Sugasti, J. A., and Garrochaga, J. V.: Lateral Aberrant Tumors of the Thyroid Gland (A propósito de los tumores aberrantes laterales de la glándula tiroidea). *Boletín de la Acad. argent. de ciruj.* 940, 24, 779.

Aberrant tumors of the thyroid gland are in no direct anatomical relation to the gland itself; for example, they may enter the thoracic cavity or they may be located laterally to the gland or at the base of the tongue. They show preference for the caudal region, underneath the sternocleidomastoid muscle, and may be unilateral or bilateral. The tumors may be encapsulated or adherent to the adjacent organs. Of 100 aberrant tumors collected from the literature, 48 were adenomas, 3 benign papilliferous tumors, malignant papilliferous tumors, and 9 cancers. 8 were not classified.

The authors report cases of lateral aberrant thyroid hypertrophy one in a twenty-nine-year-old man and the other in a man fifty-nine years of age. The first tumor was removed without difficulty and proved to be papilliferous formation. The second tumor was firmly adherent to the internal jugular vein and on histological examination was shown to be follicular adenoma with papillary formation.

JOSEPH K. KALAT, M.D.

Lindsay, J. R.: Laryngocele Ventricularis. *Ann. Otol., Rhinol. & Laryngol.* 49, 42, 641.

The term laryngocele ventricularis as used refers to an air sac which sometimes develops from the appendix or sacculus of the ventricle of the larynx. It has been found to develop in three ways. The most common is the internal laryngocele, a cystic dilatation appearing within the larynx above the false cord. The cyst dilates on forced expiration and if large may produce obstruction. It deflates on quiet respiration but may persist for some time. Hoarseness accompanies dilatation of the sac. The second type is the superior external laryngocele, in which type the sac has perforated through the thyrohyoid membrane and appears as swelling in the neck. The swelling enlarges on coughing, physical exertion with the upper extremities, or straining at stool. Distention of the sac may be accompanied by local discomfort and headache. If there is no accompanying internal laryngocele the voice is not be-

impaired. The third type is a combined internal and external laryngoele.

A study of those cases described in the literature, as well as of the case reported by Lindsay, indicates that there has been one common exciting factor in all of them, namely, an elevation of the air pressure within the glottis, to which the ventricles and the appendices which extend from the ventricles are exposed. The position of the true vocal cords during phonation can be observed by direct or indirect examination. During quiet respiration with full relaxation there is a broad aperture between both the true and false cords. During phonation of the letter "E" the true cords are approximated, while the false cords remain far apart. Phonation of "E" on inspiration also shows the false cords to be separated. Closure of the glottis on inspiration may show only the true cords to be in apposition, but if the glottis is more firmly closed, both false and true cords come into apposition. During strenuous muscular activity, the glottis is firmly closed by both false and true cords. During still more strenuous closure of the glottis, both false and true cords are in apposition. During swallowing the larynx is raised and both the true and false cords are brought into firm apposition.

Roentgenological examination with the planograph seems to indicate that closure of the glottis during strenuous muscular movements of the upper extremities, during straining, and during the early part of coughing before the glottis opens is brought

about partly by closure of the true cords, but to a much greater degree by the sphincteric action of the muscles surrounding the upper aperture of the larynx. Further, the glottis is closed in such cases to prevent the escape of air rather than to prevent inspiration. The intratracheal pressure is increased, and the pressure becomes transmitted to the ventricles, apparently because the true cords afford less resistance than the upper sphincter. The shape taken by the ventricular bands during apposition would preclude any involuntary action as an outlet valve. Closure must be maintained by muscular action. It also appears that in delivering very loud, sharp sounds, the intratracheal pressure is increased at the onset of the tone. This is accomplished by closure either at the level of the palate or by closure of the glottic sphincter, or both, and in either case the ventricles will be exposed to the increased pressure since the true cords provide relatively weak resistance.

Whether laryngoele develops as a direct hernia through the laryngeal wall, represents an inherited tendency, or develops as a result of a congenital weakness is still a matter of discussion. It appears very likely, however, that the condition develops in individuals with a congenital predisposition to it. The necessary exciting factor, namely, unusually high intraglottic pressures, is one which is commonly found in most individuals.

NOAH D. FABRICANT, M.D.

BRAIN ABSCESS

Collective Review

FRANCIS C. GRANT M.D. F.A.C.S., Philadelphia, Pennsylvania

UNTIL Morgagni in the eighteenth century showed that brain abscess resulted from disease of the mastoid or other sinuses, medical opinion held that infection in these cavities was due to an attempt of the abscess to rupture through to the surface. Maass in 533 and Fabricius Hildanus in 1606 have recorded cases of brain abscess, and Glandorp and later Boirel in 1677 speak of post-traumatic abscess of the brain which was trephined and drained with ultimate recovery. Bonetus in 1700 in his *Sepulchreum*, records autopsy findings of this condition. Morand, in 1750, successfully trephined over a carious fistula and drained a left temporosphenoidal abscess due to mastoid infection. Stoll in 1780 describes his experiences with several cases of brain abscess. Abercrombie, Cruveilhier, Hooper, Bright, and Itard early in the nineteenth century made contributions on this subject. In 848, Roux enlarged the discharging sinus track, and drained and cured a right temporosphenoidal abscess following infection of the mastoid.

Lebert in 856 in the first systematic account of brain abscess, collected a series of 80 cases from all sources, including 5 of his own. He speaks decisively against surgery as a method of treatment. In 1881, Macewen opened a left temporosphenoidal abscess by trephining through the temporal bone. Although the patient died, this would seem to be the first case in which an otitic brain abscess was opened during life without the guidance of a fistula. In 885, Schoendorff and, in 886, Truelsenbrod each reported the successful evacuation of a brain abscess encountered during mastoidectomy. In 886 Gowers and Barker diagnosed, localized, trephined, drained, and cured the first case of brain abscess in which there was no external fistula leading to the cavity. In 1887, Caird and Greenfield treated a similar case with recovery and Schwartz successfully drained a cerebellar abscess for the first time. The next year Horsley drained a left temporosphenoidal abscess, basing diagnosis and localization on the history and neurological evidence. In 1890 Braun was able to collect 7 successful operative results. Macewen a record of 15 cases with 14 recoveries, published in 1893 established firmly the necessity

for surgical drainage in the treatment of abscess of the brain. In his introduction to his monograph on *Pyogenic Diseases of the Brain and Spinal Cord*, Macewen states "he now regards an uncomplicated cerebral abscess, early recognized, accurately localized, and promptly operated on, as one of the most satisfactory of intracranial lesions, the patient at once being relieved from a perilous condition and usually restored to sound health."

ETIOLOGY

Before going further it seems wise to describe exactly the lesion under discussion. This review is concerned solely with subcortical abscess of the brain, acute or chronic, with or without capsule. Extradural, subdural, or intraparenchymal collections of pus are not under consideration. For the present purpose, when the term brain abscess is used, reference is made only to the subcortical abscess.

The frequency with which brain abscess occurs varies with the material used in computation of the figures. In a seven year period, Deane reports that 94,469 cases passed through the New York Eye and Ear Infirmary and that clinically a brain abscess was discovered in 1 patients. In 1934 Courville and Nielsen reviewed the literature on the statistics from continental European clinics where an autopsy was performed in every case. In 147,604 autopsies, 277 instances of brain abscess were found, or .19 per cent. Among 45,272 autopsies on cases with otitis media, acute or chronic, 68 (.5 per cent) revealed a brain abscess. However Evans, reporting on 2,150 autopsies from the London Hospital, records 718 cases with otitis media, and in 74, or 10.3 per cent, a brain abscess was found. The contrast between these figures may be due to the fact that in the continental European clinics, an autopsy was done in every case whereas in the London hospital, no indication exists that this was done in all instances.

It seems evident, however that chronic infection of the middle ear and mastoid is the principal cause for brain abscess. Gowers, reviewing a series of 24 such lesions found 102 (42.4 per cent) due to infection in or about the internal ear

Courville and Nielsen report 1,225 cases of brain abscess following otitis media. Eighty per cent were a sequel to chronic otitis, but 20 per cent followed acute otitis. In a compilation of the relative frequency of the various intracranial complications of otitis among 1,379 autopsied cases, it was found that 51 per cent were accompanied by an extradural abscess, 23 per cent by sinus phlebitis, 17 per cent by leptomeningitis, 8 per cent by brain abscess, and 1 per cent by subdural abscess. This figure for the frequency of brain abscess corresponds roughly with that of Evans. A mass of statistics is included in this report. Two-thirds of all brain abscesses are found in the cerebral hemispheres. Whether the abscess be cerebral or cerebellar, the right or left hemisphere is involved with equal frequency. Males are more subject to abscess than females. When a brain abscess occurs as a result of infection in the cranial sinuses, in 90 per cent of the cases the abscess is solitary, in 10 per cent multiple. Intracranial complications seem to be more frequent when the otitis is on the right side (in 58.5 per cent) than on the left (in 41.5 per cent). No difference in the age incidence occurs between cerebral and cerebellar abscess. Twelve per cent of brain abscesses appear in the first decade, 57 per cent in the second and third, 15 per cent in the fourth, and 16 per cent in patients past fifty years. Holt has reported 27 collected cases of brain abscess in infants. Sanford reviewed the literature in 1928, adding 2 cases of his own. Otitis and trauma were the most frequent causes for abscess formation. In 14 cases the abscess was cerebral, and in 4 cerebellar. Six of the 14 cerebral abscesses were multiple. Of the single cerebral lesions 5 were frontal, 2 temporal, and 1 was parietal. Staphylococci were present in 9 of the 10 cases cultured. All of the infants died.

Infection can reach the brain in one of four ways: (1) by direct implantation from a penetrating wound due either to violence or following surgical intervention, (2) by contiguous extension from an adjacent source of infection along the blood vessels or Virchow-Robin spaces, or through preformed paths, nerve sheaths, or foramina, (3) by metastatic extension from a non-adjacent source through the blood stream, and (4) by undetermined pathways from unknown sources of infection.

The results of the last war seem to show clearly that a brain abscess rarely follows head injury unless the dura is penetrated. Holmes, after review of a series of 2,357 cases of post-war head injuries, among which 37 abscesses (1.4 per cent) were found, states that post-traumatic abscess

was never encountered unless the dura had been opened. Tuffier and Guillaum confirm this opinion. Examination of the records of 5,664 post-war head injuries showed 94, or 1.4 per cent, with brain abscess. Steinthal found that 39 cases (13.7 per cent) of brain abscess occurred among 234 cases of open head wounds. Penetrating wounds or chronic osteomyelitis resulting from cranial trauma was the causative factor in every case in which an abscess occurred. All observers of postwar head wounds state that a persistent fistula due to a chronic osteomyelitis of the skull should always be cleaned out lest an intracranial abscess result from chronic infection. Foreign bodies, especially if metallic, are well tolerated in the brain. Indriven spicules of bone and non-metallic foreign bodies are much more likely to result eventually in abscess formation.

A brain abscess forms relatively rapidly after a penetrating injury. Tuffier and Guillaum, in a study of 73 cases of post-traumatic abscess found that 34 appeared within three months of injury, 15 within a year of injury, and 16 after more than a year following injury. Among Holmes' series of 37 secondary abscesses, 23 appeared within from three to six months after the wound, 4 between six and seven months, 3 between the eighth and ninth months. In Alajouanine, Maissonnet and Petit-Dutailis' series of 93 post-traumatic abscesses, 86 were solitary, 7 multiple. Patients with penetrating wounds and included foreign bodies, whether indriven spicules of bone, a bullet, or shell or bomb fragment, may develop an abscess about the source as late as twenty years after the original injury.

Evans, in his series of 194 cases of brain abscess, encountered 8, or 4.1 per cent, following a penetrating wound of the brain. No example of brain abscess was found at autopsy in 318 cases in which death followed bruising, hemorrhage, or laceration of the brain without penetration of the skull. Acute osteomyelitis of the skull was found at necropsy in 51 cases, but in no single instance could an abscess of the brain be demonstrated.

A brain abscess can be produced by surgical implantation of infection if the surgeon is unwise enough to plunge into the brain through an infected area in an attempt to locate and drain an abscess. How frequently this occurs it is impossible to say for reports of such cases are recorded but rarely. That it can happen is attested by the case described by Courville and Nielsen. A heavily encapsulated abscess of the left temporal lobe was exposed at autopsy. The numerous hemorrhagic puncture marks left by repeated and unsuccessful attempts at striking the abscess were

found in the centrum of the temporal lobe. Along the tracks made by the needle were found many pneumococci, the organism which was also found in the mastoid and middle ear. Numerous foci disclosed the characteristic findings of early abscess formation. Hamperl reports 3 similar cases.

Brain abscess develops most frequently by spread of infection from a contiguous focus. Middle-ear infection is the principal factor in its production although the paranasal sinuses are not infrequently the primary focus. In Evans' series of 194 cases of brain abscess, 13 (63 per cent) were the result of contiguous infection—in 109 cases (56 per cent) from the mastoid, in 12 (17 per cent) from the paranasal sinuses, and in 3 (1 per cent) from malignant invasion of the skull. In Egleton's analysis of 140 frontal-lobe abscesses, 104 were due to contiguous sinus infection (75 per cent frontal, 25 per cent ethmoid or sphenoid). Egleton, in analyzing the pathways of infection in 67 cases of brain abscess, found the auditory apparatus was involved in 37 and the paranasal sinuses in 18. Osteomyelitis was present in 3 and miscellaneous conditions were found in 9. In 1930 Skillern and Coates reported 17 cases of abscess in the frontal lobe due to frontal-sinus infection.

Given middle-ear infection, in what part of the mastoid does the osteomyelitis most frequently penetrate to the dura? Does spread of infection to any particular area of the mastoid produce an abscess in any definite region of the brain? A combined report of the series of cases described by Bleu, Nuchmann, Dench, Evans, and Courville and Nielsen shows 366 cases in which the spread of infection in the mastoid could be determined with accuracy. In 37 or 64 per cent the tegmen tympani or antri showed necrosis or perforation in this area with involvement of the adjacent dura. The temporosphenoidal lobe is the site of the abscess in the great majority of such cases, in 23 of 28 instances in Evans' series. Koerner in 1895 stated a "law" that in the great majority of cases of otitic abscess of the brain, the abscess would be found in the immediate neighborhood of the petrous bone in the temporal lobe or cerebellum. While this rule still holds good in the majority of cases, Nielsen and Courville after a careful search of the literature were able to find 34 cases of frontal-lobe and 27 instances of parietal lobe abscess following otogenous infection. Evans reports 6 abscesses in a series of 62 following otitic infection, which were situated in the occipital, parietal, or frontal lobes.

If therefore the tegmen tympani or antri, or the syngonatic cells of the mastoid are the focus

of infection, the temporosphenoidal lobe is the common situation in which the abscess makes its appearance.

Egleton studied the routes by which infection passed from the mastoid to the cerebellum in 135 reported cases. In 42 (33 per cent) the labyrinth and adjacent structures were involved, in another 42 (33 per cent) the lateral sinus was thrombosed, in 22 (18 per cent) the petrous bone was carious, and in 9 (7 per cent) the infection had passed through the internal auditory canal. Olata reviewed 109 cases of cerebellar abscess. Fifty-two (47 per cent) showed labyrinthitis, 43 (39 per cent) sinus thrombosis or perisinusitis. In 25 of Evans' series of 37 cases in which purulent thrombosis of the lateral sinus was disclosed, the abscess was found in the cerebellum. According to Egleton's figures, when an abscess forms in the cerebellum, the anterior part of the hemisphere is somewhat more frequently involved (30 cases) than the posterior two-thirds (23 cases). The whole of the lateral hemisphere may be occupied by the abscess cavity (1 case). Of the 135 instances of cerebellar abscess which he studied to were multiple and 2 bilateral.

Purulent sinus thrombosis, a similar involvement of the labyrinth, or osteomyelitis of the cells in Trautman's triangle suggests a cerebellar abscess.

The method by which infection passes into the brain from an adjacent focus of osteomyelitis in the wall of an infected sinus has long been matter of controversy. Certain it is that if the organisms involved are virulent when the dura and arachnoid are reached and penetrated, meningitis will develop before an abscess forms unless the sub-arachnoid space is in some fashion obliterated. Once the dura is reached, three routes for the passage of infection into the brain have been described: along the perivascular spaces or by retrograde thrombosis of the adjacent veins or arteries. MacCawen stated that infection could pass inward by retrograde thrombosis of the neighboring veins. Egleton vigorously supports this view although he as well as MacCawen agrees that the perivascular spaces might well be the channels through which organisms gain access to the brain. Wittmaak pointed out the presence of many small veins passing through the tegmen. He was of the opinion that retrograde phlebitis in these veins might produce an abscess. Heise and Beck agree with Wittmaak. Atkinson is strongly convinced that the perivascular route is the most common. In 13 of the 16 cases which he studied he believed that the abscess had been produced by this means. Piquet is of this same opinion.

The means by which infection reaches the brain is of more than simple pathological importance. If the infection has passed across the subarachnoid space as a consequence of the formation of adhesions between the dura, arachnoid, and pia, the subarachnoid space has been blocked off at that point. Hence, the establishment of drainage through this area will greatly reduce the possibility of meningitis. This is the abscess "with stalk" referred to by Koerner, who stated that 42 per cent of all contiguous abscesses had a "stalk."

When the otologist suspected the presence of an abscess following mastoid infection, the dura was exposed and examined for granulations or other evidence of infection. In this area the dura was opened or needled with the hope that in this way drainage could be established without the production of meningitis.

The frequency with which "stalk" formation occurs following contiguous abscess has been questioned. Eagleton states that in the records of 131 cases of brain abscess that he analyzed, a sinus leading to the abscess was found in but 4. In a series of 75 instances of brains containing an abscess studied by Carmichael, Kernohan, and Adson, such a "stalk" was not encountered either macroscopically or microscopically in any instance. However, in many instances the dura was not available for study and in others, the "stalk" may have been obliterated by the process itself or by the subsequent operative procedure.

Beck reports 3 cases and Drummond a single instance of spontaneous rupture of a temporal-lobe abscess through to the external surface of the brain. That this rupture occurred along the pathways involved in formation of the abscess seems highly probable.

Retrograde venous thrombosis is certainly the cause of many a cerebellar abscess when the lateral sinus is involved. Bagley has shown that the superior petrosal sinus receives veins from both the tympanic cavity through adjacent dural veins and the cortex of the temporal lobe. A vascular connection is thereby established by which infection can be transmitted from one to the other area with abscess formation at a distance from the original focus. Courville and Nielsen believe this is the way by which infection spreads from the ear to the frontal or parietal lobes. Furstenberg, and Turner and Reynolds believe that many a frontal lobe abscess is thus produced. The infection passes in through the mucous membrane lining the frontal sinus and involves the bone. From the diploë, venous channels extend backward finally reaching the internal table and joining with

veins which pierce the dura and join the cortical vessels. Once the dural veins are involved, infectious granulations appear which cut off the blood supply to the adjacent bone and spread the osteomyelitis. At some point infection may pass through the dura, form adhesions across the subarachnoid space, and produce a focus through which a subcortical abscess may be formed.

As Carmichael, Kernohan, and Adson point out, perivascular infiltration is present about every abscess. A metastatic abscess forming in the temporal lobe near the cortex, and the accompanying perivascular infiltration reaching out toward the cortex without any evidence of mastoid or middle ear infection could easily simulate stalk formation. Atkinson states that in all cases of adjacent brain abscess there is a point of entry to be found on the dura. In 43 of Evans' 74 cases of abscess complicating otitis media, in which there was focal infection of the dura and subjacent leptomeninges which bound the meninges to the surface of the cerebrum or cerebellum, the abscess beneath was separated from the meninges by a zone of macroscopically unaltered cortex and meninges. The probable method of spread in these cases was extension of the inflammation from the subarachnoid space along the perivascular spaces of perforating vessels. Unfortunately, no microscopic examination was made of the intervening tissue.

That a combination of these routes may be the means of the passage of infection into the brain seems probable. In the cases reported by Neff and Schriener, one or both of two possible pathways were involved. Infection may extend to the dura by way of the veins from the mucous membrane of the tympanum or antrum, and set up a focal pachymeningitis from which the cortical vessels are affected by contiguity. Or, a large cortical vein may pass through a focal infection in the leptomeninges over the tegmen. Thrombosis of the vein may be responsible for abscess some distance forward in the lobe, well away from the original focus.

The passage of infection through preformed paths, nerve sheaths, or foramina is not uncommon. In 55 (44 per cent) of the 125 cerebellar abscesses studied by Eagleton the infection reached the cerebellum—through the labyrinth in 19, through the vestibular aqueduct in 17, through the internal auditory meatus in 8, through the semicircular canals in 6, and through the subacute hiatus in 5. In 1 of Evans' 40 cases of cerebellar abscess, the infection reached the cerebellum through the internal auditory meatus.

A brain abscess is frequently the result of infection carried through the blood stream. In 46 (23.7 per cent) of 194 cases described by Evans the abscess was formed in this way. In 22 cases the original focus of infection was intrathoracic in 24, extrathoracic. In 7 of 22 cases due to intrapulmonary suppuration the pulmonary pathology was chronic bronchiectasis in 5, empyema.

Charrier and Ferradon have recently reviewed the literature on metastatic brain abscess consequent upon intrapulmonary infection. Among a series of 280 cases the brain abscess followed chronic bronchiectasis in 133 cases, empyema in 55 and lung abscess in 30. In 79 of 45 cases the brain abscess was solitary in 66, multiple. Fifty-nine patients had an abscess in the cerebral hemispheres, 5 in the cerebellum. Seventy per cent of the cases were males, 30 per cent females. Nickerson, basing his figures on 538 cases of septic pleuropulmonary disease, found that 74 cases of lung abscess presented 11 instances of brain abscess (14.7 per cent), 66 cases of empyema presented a single abscess (1.5 per cent) and 41 cases of bronchiectasis presented no cerebral metastasis. In 8 cases the brain abscess was single, in 4 multiple. Cohen, in reporting on 19 cases of brain abscess accompanying putrid pleuropulmonary suppuration, found that 14 occurred with lung abscess, 4 with empyema, and with bronchiectasis. Ten of the brain lesions were solitary, 4 were multiple abscesses. Of Parker's 14 cases, 7 were single abscesses, and 7 multiple. Apparently no matter what the type of septic pulmonary lesion brain abscess is always to be feared. In Schorstein's 9 cases, death occurred in from three to twenty-eight days, an average of ten days following the onset of symptoms. In Evans' series, 14 of 7 patients died within three weeks of the onset of symptoms, 9 within fourteen days. In almost one-third of this group, more than one abscess was found at autopsy. Curiously enough, acute bronchiectasis and lung abscess were infrequently the cause for brain abscess in Schorstein's report.

Brain abscess resulting from extrathoracic suppuration can result from a local focus of infection in any region of the body. Twenty-four of the 194 cases in Evans' series resulted from extrathoracic suppuration. Krause states that a brain abscess is not a frequent sequel of systemic pyemia. According to Spering endocarditis rarely results in brain abscess. However, Goldman and Schwartzman report 14 cases of abscess of the brain found at autopsy among 68 cases of streptococcus-hemolyticus bacteremia. Osteomyelitis seems to

be the predominant cause for such an abscess. Again many of these lesions in the brain are multiple.

Gowers states that following pulmonary disease, the left cerebral hemisphere is more usually involved than the right, and that the abscess is apt to develop in the frontal lobes. Evans, Groth, and Schorstein did not believe that any marked difference existed between the frequencies of involvement of the right and left hemispheres. All these authors state that in metastatic abscess, whether from intrapulmonary or extrapulmonary infection, the cerebral hemispheres are the usual site of abscess formation, the cerebellum but rarely.

King comments upon the high mortality in acute metastatic abscess of the brain. He reports a series of 6 cases of metastatic cerebral abscess, 4 acute and 2 chronic. One of the acute cases ended in recovery. King refers to but 3 other cases of acute metastatic abscess in which the patient survived (Calms and Donald, and Roul-land). King believes that the high mortality is due to early rupture into the ventricle and intracranial pressure from brain edema. Early recognition and operation within six or seven days of the onset of symptoms is essential for recovery.

A brain abscess can form by unknown pathways from an undiscovered source of infection. Yaskin, Grant, and Groff report 4 such cases. Fanner and Shambagh describe a case of brain abscess due apparently to mastoid disease, although the drum membrane was normal. A very careful search must always be made for the primary source of infection before the formation of a brain abscess is stated to result from a septic focus of unknown etiology. If the search is sufficiently detailed, the focus will always be found.

THE HISTOPATHOLOGY OF BRAIN ABSCESS

Once infection has gained an entrance into the brain structures, whether along perivascular spaces, by retrograde thrombosis, or as a septic embolus in the blood stream from an extracranial source, the development of the abscess within the brain follows much the same course. The rapidity of its spread depends upon the virulence of the organisms involved and the resistance of the host. Globus and Horn state "The earliest appearance of an abscess of the brain is that of a small circumscribed area crowded with bacteria, numerous polymorphonuclear leucocytes, lymphocytes, red blood cells, and disintegrating nerve elements. Carmichael, Kernohan, and Adson write, "It is apparent from the onset that an abscess does not have its origin *de novo* in the tissues of the

brain, but rather arises slowly from a microscopic focus and progresses usually regularly, although occasionally irregularly, to a stage of development in which owing to a certain degree of delimitation it deserves the distinction of the term abscess in its common sense.

Atkinson states that a brain abscess forms just below the cortex in the first sheet of white matter which is a relatively avascular zone. The blood vessels entering from the cortex and the central branches which pass directly upward from the base of the brain and supply the central nuclei and the main mass of the white matter are end arteries. Ott sustains this opinion but the researches of Pfeiffer, Cobb, and Lorente de No indicate that a capillary network connecting cortical and central vessels can be identified throughout this avascular zone. However, while this zone may not be entirely avascular, it seems to have a less efficient blood supply than either the cortex or the deeper layers of the white matter. It is in this area that an abscess is very frequently found. Atkinson is of the opinion that the spread of an abscess is explained by the presence of this avascular zone. The cortex is protected by its good blood supply. Extension of the abscess is to a certain extent in all directions but it tends to burrow inward along the vessels toward the lateral ventricle. Hoffman believes from a careful autopsy study of the brain in 17 cases of temporal lobe abscess that an abscess on the surface may progress in a different manner than a similar deep seated lesion. This difference in reaction depends upon a dissimilarity in the blood supply of the two regions. The cortex has a free blood supply from the cortical vessels, whereas the white matter is less well supplied and the arteries are all terminal vessels. In a deep seated abscess the tendency is always to extend inward toward the inferior horn of the lateral ventricle. In 6 of this author's 12 cases, rupture into the ventricle had occurred. A cortical abscess much less frequently breaks into the cortical subarachnoid space because extension in this direction is checked by the excellent blood supply. However, 2 of these 12 cases showed encapsulation. In the cerebellum an abscess develops in one lobule, extends backward in it, pushes adjacent lobules aside, and involves them secondarily only.

Carmichael, Kernohan, and Adson have outlined the following stages in the development of an abscess for the purpose of description:

- 1 Local necrosis, microgliosis
- 2 Primary delimitation, fibrosis
- 3 Secondary delimitation, astrogliosis
- 4 Repair, vascularization

In the first stage the outstanding feature of these lesions is the central necrotic core composed of polymorphonuclear cells, lymphocytes, monocytes, and gutter cells. The blood vessels show hyperemia, perivascular infiltration, occlusive endarteritis, endophlebitis and hemorrhage. Microglia cells are especially numerous and are the earliest participants among the cerebral elements of the inflammatory reaction. Globus and Horn comment that at this stage a number of adjacent vessels may show evidence of involvement, and, as the necrosis from interference with the vascular supply spreads, these separate areas coalesce to form the body of the abscess. In this stage the abscess consists of two layers: the central necrotic core which is surrounded by a vague ill defined region of hyperemia and microphiosis.

In the second stage the necrotic center of the abscess is still present although evidence of acute infection is less marked. The microglia have assumed rod or irregularly shaped forms. Astrocytes appear in greater numbers at a distance from the central zone of necrosis. The principal change in this stage is the appearance of fibroblasts, especially in the zone of hyperemia lying adjacent to the necrotic border. Carmichael, Kernohan and Adson, Diamond and Bassoe, and Freeman believe that the fibroblasts arise from the proliferating blood vessels. Hassin, and Globus and Horn believe that they are derived from lymphocytes which have migrated into the area of infection. In this stage the abscess is formed by three layers merging one into another—the central area of liquefaction necrosis, an adjacent region of hyperemia and fibroblastic proliferation, and the external poorly defined layer of early astrogliosis.

In the third phase a definite proliferation of blood vessels is noted. These new blood vessels have no perivascular spaces, which suggests that they are newly formed. There is an increase in the number of microglia, astroglia, and fibroblasts. The fibrous zone about the abscess is greater in extent and more compact. Finally, in the fourth stage, a definite delimitation of the size of the abscess occurs. Four layers may be identified—a central necrotic zone, with its revascularizing granulosomatous border, a zone of hyperemia and fibrosis, and lastly an external zone of gliosis. Horn and Alpers have described the histopathology of abscess formation in practically the same stages as here outlined. However, Horn notes as his fourth layer, a rarefied area composed of edematous brain tissue, encircling the abscess. Alpers speaks of an encephalitic zone surrounding it. From the clinical standpoint these slightly dif-

fering descriptions are of importance. The zone of edema may account for symptoms of pressure otherwise inexplicable when the abscess is small. The outlying area of encephalitis shows that even an encapsulated abscess may not be quiescent.

The time of formation of the abscess capsule seems to depend upon two factors, the virulence of the organisms involved and the resistance of the host. A study of the reports of Homén, Westphal, Merken, Lebert, and Uchermann, Schatt, and Jansen shows that a capsule may never form about an abscess, may be very slow in its development, or may be definitely present by the end of the second week. In Alpers' series, when encapsulation took place, the process was well defined by the end of the third week after the onset of symptoms. One abscess, however had no capsule at the end of eleven months. All of Schorstein's 19 cases of metastatic abscess showed a capsule after seventeen days. Krause, and Seelhoff's after the twenty fourth day. If delimitation by encapsulation occurs, the process is well defined by the end of the third week. An abscess as it becomes older does not, therefore, become more heavily encapsulated. A relatively acute abscess may have a thick wall.

Any of the infectious bacteria can produce brain abscess. Those organisms most commonly found in the sinuses, streptococci or pneumococci, are most frequently recovered from a contiguous brain abscess resulting from infection in those areas (Doelger, Focinelles, Hammler). However staphylococci will be found in many post traumatic or metastatic abscesses (Coleman, Alpers).

The type of organism involved seems to have a bearing on the speed and degree of encapsulation. Brunner states that destructive and necrotic changes are increased by the gram-negative anaerobic bacteria, but aerobic organisms influence the reparative process and, hence capsule formation. Neumann writes that the anaerobic bacteria prevent the development of capsule, while the cocci, especially the capsular cocci, produce a layer of fibrin soon after penetration into the substance of the brain and, hence lead to the formation of capsule. It is agreed that anaerobic bacteria do not favor the formation of a capsule while aerobic organisms, especially the cocci tend to aid encapsulation. It must always be remembered that an encapsulated abscess is not by any means quiescent abscess. Within the cavity of the abscess may be virulent bacteria which if permitted to escape into the meninges may produce fatal meningitis. Practically all abscesses contain bacteria. Only occasionally is a sterile abscess encountered.

The pathological development of a brain abscess has been detailed because of the importance of delimitation and capsule formation in determining the proper time for surgical drainage. Definite rules apply to the drainage of infectious processes elsewhere in the body. No surgeon opens a furuncle until it is localized. The same principles should apply to a brain abscess. The best surgical results have followed operation after encapsulation or at least, limitation of spread of the abscess has occurred. Nice surgical judgment and much experience are required to reach the decision whether or not a brain abscess has become localized. Operate too early and but little is found save spreading encephalitis. Wait too long and the abscess may rupture into the ventricle or the patient may be carried off by a sudden and unexpected rise of intracranial pressure.

SYMPTOMS OF BRAIN ABSCESS

The symptoms of brain abscess can develop in many ways. The sudden abrupt appearance of clinical evidence of an intracranial lesion suggests cerebral hemorrhage. However a hematogenous abscess may produce a clinical picture of this variety. Condon and Alajouanine and Petit Dutailly report that a patient who has had a penetrating brain wound and apparently been in perfect health for a number of years may suddenly develop an intense headache, become rapidly stuporous, and die within twenty four hours from rupture of a latent abscess into the ventricle and from fulminating meningitis. Or the headache may appear more slowly; the patient sinks into a stupor gradually, the neck is stiff and organisms are found in the spinal fluid, all being due to a slowly leaking abscess. In this group the meningitic signs predominate. Occasionally a convulsive attack may be the first evidence of the presence of a brain abscess.

As a rule the symptoms of a brain abscess develop slowly in a fashion similar to those due to any intracranial mass lesion, whether that lesion be tumor, abscess, or chronic subdural hemorrhage. In any clinic passing upon a large neurological material, errors in differential diagnosis between these three intracranial mass lesions are not infrequent. This may seem strange to the otologist, whose problem has been in the past not so much one of differential diagnosis, but of determining whether an abscess was present, and, if so, what its situation. However from the very nature of the otological material, the decision is simplified because an antecedent history of mastoid or paranasal sinus infection is present. The neurologist and neurosurgeon have come to learn

that the determining factor in reaching a presumptive diagnosis of brain abscess is a history of infection preceding the onset of symptoms. This infection may be of any variety in any area. Sinus disease, cranial trauma, and intrathoracic suppuration are well recognized foci, but until the realization is driven home that any infection may be a potential cause for brain abscess this differential diagnosis will be missed with consequent disastrous results. A history of previous infection is often hard to obtain. The infection may have been trivial and in the distant past, overlooked even after careful questioning. Or, the patient's mental condition may be such that reliable answers are not forthcoming, and the history from friends or relatives incomplete through ignorance. Any evidence of infection in the patient's history should cause grave suspicion that a brain abscess is present. Surgical attack on the lesion should under these circumstances be based on the presumption that the lesion is an abscess until clear proof to the contrary exists.

In addition to an antecedent history of infection, headache and retardation of mental processes are important indications that an abscess is present. Tumor or chronic subdural hemorrhage can produce these symptoms, but they are particularly striking with abscess. Headache is an early complaint and may become intense, not infrequently tending to localize either on the side of or directly over the abscess. A patient with an abscess seems on the whole to be less alert than his general condition warrants. As Kennedy puts it—a brain abscess produces a "muddled intellect" to a more obvious degree than does a tumor.

Nausea and vomiting, projectile in type, are frequently seen with abscess, although not more so than with hemorrhage or tumor. Constipation is common. A temperature that tends to be subnormal has long been recorded as characteristic of abscess. This is true, although a metastatic abscess may, at the development of symptoms, produce a mild pyrexia. Retardation of pulse and respiration are certainly more common when an abscess is present than when a brain tumor is found. Macewen and Okada have called attention to the emaciation which may accompany an abscess of the cerebellum.

Eagleton and others have claimed that papilledema is an uncommon result of abscess. Eagleton's material was made up for the most part of cases of contiguous abscess from sinus disease in which immediate surgery prior to encapsulation was urged. However, White, in studying 184 cases of intracranial complications of otitic origin, found papilledema in 68 per cent of the cases of

temporosphenoidal abscess and in 38 per cent of those of cerebellar abscess. Blau reports choking in 54 per cent of 153 cases of cerebral abscess, and in 34 per cent of 57 cases of other cerebellar lesions. Parker found choked disc in 14 (56 per cent) of 25 cases of brain abscess, Benedict and Lillie in 8 of 11 cases of abscess of the frontal lobe. Choked disc was recorded in 20 of 30 cases in Grant's series in which encapsulation of the abscess had occurred. Cowan found frank choking of the disc in 28 (63.6 per cent) of 44 verified cases of abscess. In this group 42.8 per cent of the cases of cerebellar abscess had definite papilledema up to 5 diopters. Coleman states that evidence of intracranial pressure on fundoscopic examination may be found in patients with abscess with the same frequency as in patients with brain tumor. Obviously, certain abscesses, like certain tumors, may advance rapidly and destroy brain tissue without increasing the intracranial pressure. An encapsulated abscess seems to produce papilledema in most cases. Curiously enough a cerebellar abscess is generally reported less likely to cause choked disc than a tumor in a similar location, although Atkinson denies this. Like a tumor, the abscess may or may not be situated ipsilateral to the fundus showing the larger swelling.

As a rule the leucocyte count in the blood is no more than suggestive when a brain abscess is present. Unfortunately, this is true particularly when a sinus or intrathoracic infection already exists, which can of itself account for the increase in leucocytosis.

Lumbar puncture may give important information with respect to the intracranial pressure, the presence or absence of pleocytosis in the spinal fluid, and the amount of albuminosis. If the initial pressure is high, withdrawal of fluid should be done with extreme caution. A fluid which is almost always sterile and shows a relatively low cell count suggests abscess. Yerger states that the cell count is usually below 500 per cu mm. He found that any cell count over 10,000 per cu mm was always accompanied by a septic meningitis. The higher the cell count was, the more active the infectious process. An encapsulated, subsiding infection may show very few cells, all lymphocytes. Andre-Thomas, Borries, and Lecene, Mestrezat, and Boutter have called attention to the fact that a low cell count and a high albumen content in the fluid is suggestive of a walled-off abscess. Woltman, Van Caneghem and Leroy, Dixon, and Karbowski have noted that a relatively small number of cells, especially when these cells are lymphocytes, point to abscess formation.

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frontal-lobe, noted 5 with exophthalmos, swelling of the eyelids, chemosis of the conjunctiva, and pain in or about the eye. Seven cases showed orbital involvement without exophthalmos. All these findings appeared in the eye ipsilateral to the abscess. Personality changes, witzelsucht, headache referred to the frontal area, a tendency to yawn, and, if the abscess is left-sided, a speech defect of the motor variety may be seen. Again the central type of contralateral facial paralysis may appear early and be followed by weakness of the contralateral extremities and a Babinski sign. Connor has reviewed the ocular manifestations accompanying frontal lobe abscess. Among 202 cases, involvement of the oculomotor nerve in 22 instances and of the abducens nerve in 11 instances was recorded. Pupillary changes were noted in 43 patients. Among 202 cases 80 revealed fundus changes, 5 showed atrophy, and 75 gave evidence of pressure from congestion to true choking. Cowan records a frank choking of the disc in 11 of his 17 patients.

Atkinson states that in cerebellar abscess "cerebellar nystagmus is slow, coarse and horizontal, in contrast to the rapid fire rotary nystagmus of labyrinthine disease, and is characteristically to the side of the lesion, though it may be accompanied by a quick, irregular nystagmus to the opposite side which may cause confusion, falling is to the affected side, pointing error is always outward and with the homolateral arm only, ataxia and dysidiadochokinesia are usually present to some degree, especially the former. A dead labyrinth to the Barany test plus nystagmus toward the side of the lesion is always very suggestive of a cerebellar abscess."

Röntgen-ray studies may be of value. The focus of infection and its extent may be shown, a foreign body revealed, and occasionally, as reported by Bagley, gas may form in an abscess and reveal its position. The position of the pineal gland, if it can be visualized, may give very vital information (Naffziger).

While the reports in the literature on the use of air in the localization of brain abscess are infrequent (Martin, Aubry and Guillaume), no experienced neurosurgeon would have any hesitation in employing ventricular estimation, ventriculography, or encephalography for localization. The danger of rupture of a thin-walled abscess is always present following this procedure. However, no effective surgical measures are possible unless the abscess can be localized. Therefore, the information to be gained by air insufflation fully justifies the risk involved. Moniz reports that he has localized a brain abscess by

cerebral angiography. The reviewer is not familiar with this technique, but believes that since an unlocalized and therefore undrained abscess always results in a fatality, any reasonably safe method which results in accurate determination of its position should be used without hesitation.

The surgery of brain abscess gives the reviewer little cause for enthusiasm. Of all the surgical lesions in the brain, an abscess is the most treacherous. The potential complications that can be foreseen in an attack upon such a lesion are manifold. Diagnosis and localization may be easy, the time for surgical intervention may have seemingly been properly chosen, and the maneuvers to evacuate the pus correctly planned and executed, but only too frequently the patient dies. And even if the patient is discharged as cured, careful follow-up examinations will show a high proportion of unfortunate sequelæ.

Brain abscess until recently was considered to fall for the most part into the domain of the otologist, since by far the greater number of these lesions were encountered as a complication of mastoid or paranasal sinus disease. Only in the last twenty years has the neurosurgeon had the opportunity to operate upon many of them. And the neurosurgeon, being well versed in the handling of intracranial problems, such as pressure and its relief, in the interpretation of clinical neurological signs, in localization by the use of air, and in the employment of surgical procedures found valuable in removing brain tumors, has lowered somewhat the surgical mortality of abscess. Furthermore, the otologists seem quite willing to turn over these difficult cases to the neurosurgeon. Consequently, while the literature on the surgery of brain abscess prior to 1925 is written almost entirely by otologists, since that time many reviews of large series of cases and new suggestions for attacking these lesions have originated in neurosurgical clinics.

The three great problems to be solved in an attack upon a brain abscess are where, when, and how to operate. In the reviewer's opinion, where to operate can easily be determined, how to operate is, of course, important, but the decision as to when to operate is vital, requires the nicest judgment and the greatest experience, and, in the last analysis, determines the result. In other words, any reasonable surgical procedure, if applied at the proper time, has a better chance of success than a very skillful maneuver undertaken at the wrong moment.

In 1893, MacEwen published the first surgical results in a large series of cases of brain abscess. Of 13 cerebral abscesses (10 temporo-sphenoidal,

The clinical findings described—a history of infection, followed by headache, mental dullness, vomiting, slow pulse and respirations, papilledema, and increased tension on lumbar puncture—are evidence of intracranial pressure suggesting the presence of an intracranial mass lesion, presumably abscess, but are in no way indicative of its position within the brain.

While it does not fall within the province of this review to discuss in detail the neurological evidence upon which the localization of abscess is based, the following facts seem important. The position of the primary focus of infection is of value in localization. As has been noted, an abscess consequent upon mastoid disease is most frequently found in the adjacent temporosphenoidal lobe (66 per cent) and next most frequently in the ipsilateral cerebellar lobe (33 per cent). Paranasal sinus infection is followed, as a rule by an abscess which forms in the adjacent frontal lobe.

The reviewer believes that if the patient's condition permits, the primary focus of a suspected adjacent abscess should always be eradicated before the abscess is drained. First, because the operation may show the area in which the infection has passed through the bone to the dura and thus help in suggesting the position of the abscess, and, second, because unless the primary focus has been eliminated, re-infection of the abscess cavity may occur and nullify an apparently successful drainage of the cavity. Tylor states that in 29 of 47 cases of brain abscess following mastoid disease the abscess was in the temporosphenoidal lobe, and in 12 in the cerebellum. In 12 of those in which the abscess was located in the temporal lobe the infection occurred through the tegmen tympani, and in 5 through the posterior tympanic wall, mastoid cells, or antrum. Among the 12 cerebellar abscesses, the infection spread through the posterior tympanic wall, mastoid cells, or antrum in 4 from the lateral sinus in 3 and from the labyrinth in 4. Involvement of the tegmen then implies a temporosphenoidal abscess, while involvement of the lateral sinus or labyrinth suggests a cerebellar abscess.

The history of the exact nature of a previous head injury and the presence of a scar on the scalp may be important clues as to the position of a post-traumatic abscess. All authors agree that an abscess due to a penetrating wound always forms along the tract produced by the injury. Since acute trauma of this type involving the cerebellum is usually fatal, a post-traumatic cerebellar abscess is uncommon.

Statistics seem to show that a hematogenous abscess tends to form in the fore part of either cerebral hemisphere and that the left side is possibly more frequently involved than the right. The cerebellum is very infrequently the site of a hematogenous abscess.

Since mastoid disease is the most common cause for brain abscess and since the larger number of these lesions are found in the adjacent temporal lobe, a brief review of MacCormac's findings in these cases is pertinent. Otorrhea, occasionally acute but predominantly chronic, is present. The discharge increases following exposure or a cold, then ceases, and pain develops in the ear. After from twenty-four to forty-eight hours of severe local distress with loss of appetite and vomiting, the pain subsides. A chill varying in degree from a mere feeling of cold to a violent pyrexia occurs. In a day or two all these symptoms may disappear although a mild intermittent dull headache remains. Gradually the headache increases, cerebation becomes slowly dulled, and there is a marked want of sustained attention. Percussion over the temporal bone above the mastoid may be painful. A weakness of the opposite side of the face of the central type is often the first neurological sign of any value. Lebert is the only author to stress the presence of a convulsive attack as an early manifestation of abscess. Gradually the muscular power of the opposite arm may become involved. A contralateral Babinski reflex may be noted. A temporal lobe abscess on either side can produce a defect in the visual fields, usually a contralateral homonymous hemianopsia, partial or complete. However the patient may be so inattentive or stuporous that visual field tests are unreliable. In his series of 23 patients with abscess, Coleman could apply these tests in but 9. Cowan found visual defects of this character in 3 of 9 verified cases of abscess in the temporal lobe and in 2 of 4 cases of abscess in the occipital lobe. The reviewer can only say that visual-field studies be made promptly in every patient suspected of harboring an abscess. If made before the patient's cooperation is lost, they should be of the same value in localizing an abscess as they are when a tumor is present. As abscess of the left temporal lobe in a right-handed individual causes speech difficulties, usually in the nature of an inability correctly to name objects or to use words in their proper meaning.

A frontal-lobe abscess may be difficult to localize. Previous infection in the paranasal sinuses is always suggestive of an adjacent abscess. Cowan in a study of 17 cases of abscess of the

with 10 recoveries Meurman, reviewing the 56 cases of brain abscess seen at the Otolaryngologic Clinic of the University of Helsingfors from 1901 to 1932, found 31 cerebral and 24 cerebellar lesions with a 71 per cent mortality from the cerebral and a 70 per cent mortality from the cerebellar lesions Fraser and Blomfield, in 1907, 1917, 17 consecutive cases of cerebral abscess which were consequent upon otitis media and operated upon at the Royal Infirmary in Edinburgh from 1908 to 1929, report 6 recoveries and 11 deaths Balido and Franke in 1928 reported from Argentina 6 cases of abscess with 5 deaths Dench in 1929, reviewing 27 cases which were seen personally and included 11 encountered in a seven-year period in the New York Eye and Ear Infirmary, reports 21 cerebral abscesses with 9 recoveries (40 per cent) and 12 deaths (60 per cent), and 6 cerebellar abscesses with 2 recoveries (33 per cent) and 4 deaths (66 per cent) In 1936, Piquet and Minne of France recorded 16 cerebral abscesses with 7 recoveries, and 6 cerebellar abscesses with 3 cures These authors reviewed the cases of solitary encapsulated abscess reported in the literature from 1920 to 1929 Among 65 patients harboring a cerebral abscess, 57 recovered (87 per cent) and 8 died Among 25 patients with a cerebellar abscess 17 recovered (68 per cent) and 8 died These figures are much superior to those quoted by Neumann or collected by the reviewer which represent for the most part the period from 1900 to 1920 However, Piquet and Minne give no details as to the cause of the abscesses included in their report The reviewer suspects that while many of them were unquestionably of otogenic or hemogenic origin and were of the adjacent type, a number of post-traumatic abscesses consequent to injuries received in the World War may have been included An abscess of this type is easier to diagnose and cure surgically than a contiguous abscess from sinus disease Puusepp reports 44 recoveries among 55 cases of traumatic abscess (80 per cent) Alajouanine and Petit-Dutailh report 32 cases with 22 recoveries (70 per cent) These figures could of course be multiplied They have been selected with some care to give results from the larger clinics in various countries

Neumann, in commenting upon the comparative figures in the Austro-German Clinics and upon Macewen's record, stated that in his opinion the reasons for the latter's success were that he refused to operate in the presence of meningitis or other serious complications, that he operated through a relatively clean field which had been painted with 20 per cent carbolic solution, and

performed the operations himself, personally supervising the after-care The reviewer in reading what details are available on these series of cases was struck with the high percentage of meningitis as a postoperative sequel (Iremel) Furthermore, since in the great majority of them the abscess resulted from otitic suppuration, the complications inherent in infection in this area, i.e., sinus thrombosis, petrositis, meningitis, had all to be contended with

When abscess of the brain develops in the presence of thrombosis of the sinuses, establishment of the fact that the abscess exists may be extremely difficult, if not impossible If, in the absence of involvement of the lateral sinus, an abscess develops without positive evidence betraying its presence, the stormy course of the usual thrombosis of the lateral sinus will almost certainly cover up the less obtrusive symptomatology of the abscess formation

Mjyind reports the results of 207 cases of various intracranial complications of otogenous disease Among these were 43 brain abscesses with but 4 recoveries He shows that any patient with an intracranial suppuration faces a higher mortality with the development of a new complication Among these 207 cases 35 per cent had more than one intracranial lesion Of these, 50 had a spread of the original infection into a second area with but 24 per cent of recoveries, 10 cases had 3 pathological processes with 12 per cent of recoveries, and 7 cases had 4 different intracranial suppurative lesions with no recoveries Eaddy and Secker report 9 cases of meningitis and death among 14 brain abscesses

However, in all these series of cases, there was obviously much too much exploration of the brain through an infected dura as a last resort in a desperately sick patient Diagnosis was bad, localization worse Too many fingers and hemostats were thrust into the brain in searching for the abscess Methods of drainage were inadequate Again a careful study of the figures will show that relatively few cases of abscess were encountered by any one operator Consequently, no single surgeon had sufficient experience to enable him to develop a satisfactory technique Certainly none of them had encountered personally and in as short a time as large a number of abscess cases as had Macewen

The situation the otological surgeon has had to face has always been serious when the presence of a brain abscess has been suspected The mastoid area or paranasal sinuses are infected and present themselves in the line of the proposed drainage tract How can the position of the ab-

2 frontal, 1 parietal) 11 were operated upon with recovery in 10. Two patients, one with a frontal-lobe abscess, and the other with a temporal-lobe abscess, died without operation. The operative fatality followed evacuation of a temporal-lobe abscess. In extremis from rupture of the abscess into the lateral ventricle. Eight cerebellar lesions were seen, 2 not under MacCewen's care and were not attacked surgically. The 4 cases of cerebellar abscess which were drained all ended in recovery. One of these presented a multiple abscess, in the cerebellum and in the posterior portion of the adjacent temporal lobe. The record of 15 operations for abscess with 14 recoveries is so far superior to any made for the next thirty-five years that a short discussion of the reasons for MacCewen's success seems pertinent.

MacCewen furnishes complete details of his methods of handling 12 cases of abscess, 8 cerebral, 3 cerebellar and a multiple abscess of the cerebrum and cerebellum. Six of the cerebral and all of the cerebellar followed mastoid disease. Two of the cerebral, frontal and parietal in position, followed trauma fracture of the skull and infection.

The reviewer believes from careful study of the protocols on these cases, that the principal cause for the high percentage of recovery in this series is that operation was delayed, either as a result of MacCewen's decision or by force of circumstance, until the abscess had become well encapsulated. On 5 occasions only was drainage instituted prior to two weeks from the onset of symptoms. Seven patients had early or well marked choked disc. Three were so stuporous when operated upon that no anesthesia was required. In every case the abscess was "ripe" when opened. Also, the original focus of infection was always eradicated before drainage was instituted. The mastoid was promptly and radically drained. However after this had been accomplished and information derived therefrom as to the point at which infection had penetrated the bone MacCewen seemed in no hurry to drain the abscess itself. The extreme care with which neurological evidence and other data were recorded gives the impression that he believed that delay was justified, () to note the result of the radical mastoidectomy on the condition of the patient, and () to be sure that the localization was correct. Lastly, he drained for the most part by enlarging his incision into a relatively clean field, sterilized the dura with 70 per cent carbolic solution, opened the abscess cavity widely and cleaned it out under direct inspection and by irrigation before

drainage was introduced. The drain was of non-rigid material and was not disturbed following its accurate insertion.

With this record as an indication of what could be done by a properly timed and executed attack upon a brain abscess, especially since MacCewen described all the technical maneuvers involved, the surgery of this lesion seemingly had been placed upon a firm basis. However subsequent results show that his teachings were disregarded. Koerber in 1925 reports on the mortality rate in brain abscess from cases collected in the literature up to 1901. Two hundred and twelve cases of cerebral abscess are recorded with 92.5 per cent recovery and 35 cases of cerebellar abscess with 51.8 per cent recovery. His combined statistics since 1901 show that 24 among 126 cases of cerebral abscess and 30 among 67 cases of cerebellar abscess were not found at operation. Of 1 patients with cerebral abscesses operated upon 42 (41 per cent) recovered and 60 (59 per cent) died. Thirty-seven cases of cerebellar abscess were explored with 7 (19 per cent) recoveries and 30 (81 per cent) deaths. Neumann in 1930, combining the results from 19 Austro-German otological clinics, published for the most part prior to 1920, gives the following figures, among 387 patients with abscess of the temporal lobe 37 (61 per cent) died and 150 (39 per cent) recovered following surgical intervention. Of a group of 124 patients with cerebellar abscess, 109 (88 per cent) died and 15 (12 per cent) recovered. Other statistics not included in Neumann's report are available. Richter and Brock analyzed 47 cases of otitic brain abscess treated in the Erlangen Clinic from 911 to 1934. Among the 47 cases were 24 temporal-lobe lesions with 12 deaths (50 per cent), and 23 cerebellar abscesses with 19 (75 per cent) deaths. Beck and Pollach, reporting on 40 cases of cerebellar abscess encountered in the Vienna University Clinic from 1919 to 1927 stated that 37 were recognized and operated upon with 12 recoveries (32.5 per cent) and 25 deaths (67.5 per cent). Brunner and Ditch present a series of 29 cases of otogenous abscess of the temporal lobe. Four were found at autopsy. Twenty five were operated upon with 8 (32 per cent) recoveries and 17 (68 per cent) deaths. Hagerup in 1936, reviewing 12 cases of rhinogenic abscess seen at the Municipal Hospital in Copenhagen between 1906 and 1933, 10 single and 2 multiple, reports 11 deaths. In 1925 Hagerup from Holland recorded 28 cases following otitis. 24 cerebral lesions with 9 recoveries and 4 cerebellar lesions with 1 recovery. Lind of Stockholm in 1927 reported 54 cases of abscess

GRANT BRAIN ABSCESS

with 10 recoveries. Meurman, reviewing the 56 cases of brain abscess seen at the Otolaryngologic Clinic of the University of Helsingfors from 1901 to 1932, found 31 cerebral and 24 cerebellar lesions with a 71 per cent mortality from the cerebral and a 70 per cent mortality from the cerebellar lesions. Fraser and Blomfield, in analyzing 17 consecutive cases of cerebral abscess which were consequent upon otitis media and operated upon at the Royal Infirmary in Edinburgh from 1908 to 1929, report 6 recoveries and 11 deaths. Balado and Franke in 1928 reported from Argentina 6 cases of abscess with 5 deaths. Dench in 1929, reviewing 27 cases which were seen personally and included 11 encountered in a seven-year period in the New York Eye and Ear Infirmary, reports 21 cerebral abscesses with 9 recoveries (40 per cent) and 12 deaths (60 per cent), and 6 cerebellar abscesses with 2 recoveries (33 per cent) and 4 deaths (66 per cent). In 1936, Piquet and Minne of France recorded 16 cerebral abscesses with 7 recoveries, and 6 cerebellar abscesses with 3 cures. These authors reviewed the cases of solitary encapsulated abscess reported in the literature from 1920 to 1929. Among 65 patients harboring a cerebral abscess, 57 recovered (87 per cent) and 8 died. Among 25 patients with a cerebellar abscess 17 recovered (68 per cent) and 8 died. These figures are much superior to those quoted by Neumann or collected by the reviewer which represent for the most part the period from 1900 to 1920. However, Piquet and Minne give no details as to the cause of the abscesses included in their report. The reviewer suspects that while many of them were unquestionably of otogenic or hemogenic origin and were of the adjacent type, a number of post-traumatic abscesses consequent to injuries received in the World War may have been included. An abscess of this type is easier to diagnose and cure surgically than a contiguous abscess from sinus disease. Puusepp reports 44 recoveries among 55 cases of traumatic abscess (80 per cent). Alajouanine and Petit-Dutailis report 32 cases with 22 recoveries (70 per cent). These figures could of course be multiplied. They have been selected with some care to give results from the larger clinics in various countries.

Neumann, in commenting upon the comparative figures in the Austro-German Clinics and upon Macewen's record, stated that in his opinion the reasons for the latter's success were that he refused to operate in the presence of meningitis or other serious complications, that he operated through a relatively clean field which had been painted with 20 per cent carbolic solution, and

performed the operations himself, personally supervising the after-care. The reviewer in reading what details are available on these series of cases was struck with the high percentage of meningitis as a postoperative sequel (Tremel). Furthermore, since in the great majority of them the abscess resulted from otitic suppuration, the complications inherent in infection in this area, i.e., sinus thrombosis, petrositis, meningitis, had all to be contended with.

When abscess of the brain develops in the presence of thrombosis of the sinuses, establishment of the fact that the abscess exists may be extremely difficult, if not impossible. If, in the absence of involvement of the lateral sinus, an abscess develops without positive evidence betraying its presence, the stormy course of the usual thrombosis of the lateral sinus will almost certainly cover up the less obtrusive symptomatology of the abscess formation.

Vigand reports the results of 207 cases of various intracranial complications of otogenous disease. Among these were 43 brain abscesses with but 4 recoveries. He shows that any patient with an intracranial suppuration faces a high mortality with the development of a new complication. Among these 207 cases 35 per cent had more than one intracranial lesion. Of these 50 had a spread of the original infection into second area with but 24 per cent of recoveries. 10 cases had 3 pathological processes with 10 per cent of recoveries, and 7 cases had 4 different intracranial suppurative lesions with no recoveries. Eaddy and Sekerak report 9 cases of meningitis and death among 14 brain abscesses.

However, in all these series of cases, there is obviously much too much exploration of the brain through an infected dura as a last resort in a desperately sick patient. Diagnosis was localization worse. Too many fingers and hands were thrust into the brain in searching for the abscess. Methods of drainage were inadequate. Again a careful study of the figures show that relatively few cases of abscess encountered by any one operator. Consequently no single surgeon had sufficient experience to enable him to develop a satisfactory technique. Certainly none of them had encountered practically and in as short a time as large a number of abscess cases as had Macewen.

The situation the otological surgeon has to face has always been serious when the presence of a brain abscess has been suspected. The otoid area or paranasal sinuses are infected and present themselves in the line of the drainage tract. How can the position of

access be determined and adequate drainage obtained without infecting the subarachnoid space and producing meningitis? Should an operation for abscess be done through a clean field separate from the primary focus? Piquet, Moulon-guet, Ombredanne, Andre-Thomas, and Laurens and Girard, Aboulker and Badaroux, Ramadler et al. have discussed this problem at length. The advantages connected with working through the primary focus of infection in draining an adjacent abscess are that the septic process can be thoroughly eradicated and the course of the infection through the bone can be determined, which reveals a definite clue as to the site of the abscess. Further more, an extradural abscess which may give a clinical picture that closely simulates a subcortical abscess can be found and drained. Finally if granulation tissue thickening, or other change is found on the dura, the subarachnoid space is usually sealed off by adhesions beneath this region and a plunge for abscess and drainage through this area may not result in meningitis. The disadvantages of plunge for abscess and the establishment of drainage through an infected field are that the operator is cramped for space in instituting drainage, and that he is entering the brain through an infected field. If no abscess is found, the introduction of a cannula may well carry in infection and cause meningitis or encephalitis.

On the other hand, if exploration for abscess is made through a clean field away from the infected mastoid or frontal sinus, the puncture if negative, will do no harm. However if the abscess is reached drainage must be undertaken through the subarachnoid space in an area unprotected by adhesions. This danger can be overcome by only opening the dura at first and then waiting from twenty four to forty-eight hours for adhesions to form before exploration is made and drainage established. Much more room for surgical manipulation and the introduction of drainage can be obtained through a clean field. However by this maneuver the original source of infection is not eradicated, which may lead to the reappearance of the abscess in spite of apparently adequate drainage.

Moulon-guet, in an attempt to settle this question, reviewed the literature from 1906 to 1914. He found the following statistics: cases operated on by the mastoid route—81 with 39 deaths and 42 (53 per cent) recoveries; operation through the mastoid with marked enlargement of the opening in the bone—19 cases, with 8 deaths and 11 (59 per cent) recoveries; operation through a clean field—23 with 8 deaths and 15 (73.9 per cent)

recoveries. However Dench in 1907 in collecting the literature up to that date reports that of 37 patients with abscess operated upon through a sterile field 18 (49 per cent) recovered and 19 died, whereas of 41 operated upon through the avenue of infection 27 (66 per cent) recovered and 14 died. In this same paper Dench provides figures in an attempt to clear up the point as to whether a cerebellar abscess should be opened in front of or behind the lateral sinus. He states that among 45 patients in whom the incision was made behind the sinus 25 (55 per cent) recovered and 20 died whereas of 11 in whom the incision was made in front of the sinus 4 (36 per cent) recovered and 7 died. Egleton and others have recommended obliteration of the sinus between ligatures and incision through its posterior wall is drainage of a cerebellar sinus.

In recent years various efforts have been made to prevent many of the postoperative complications following drainage of an abscess. Lemaire in 1920 suggested the introduction of a small needle through the area of dural granulation over a suspected abscess, the aspiration of drop or two of pus in confirmation of its presence and withdrawal of the needle. On subsequent days larger needles and, finally a filiform catheter were introduced along the drainage tract to dilate it slowly and to prevent meningitis by keeping within the area of subarachnoid adhesions. Downman in 1923 suggested that the dura be opened and packed off to produce adhesions before drainage was attempted. Moulon-guet believed that dural incision alone was sufficient because the intracranial pressure would force the cortex out through the incision and thus create adhesions (Bouton cérébral). The difficulties with the introduction and maintenance of adequate drainage were attacked in two ways. Kim in 1923 suggested that a large defect in the skull be created over the abscess, the overlying cortex removed, and instead of the introduction of drainage, the abscess be permitted to herniate out through the opening. Spasokukowsky in 1914, and Dandy in 1920, stated that a simple tap of the abscess through a small trephine hole with a hollow needle on one or more occasions with evacuation of pus would result in a cure. Lastly Vincent has advocated a craniotomy and removal of the encapsulated abscess *en masse* without drainage, in a manner similar to the extirpation of solid tumor.

The operations directed against a brain abscess fall into two groups and depend upon the site of the opening in the overlying cranial bone. A group of neurosurgeons following the excellent

results obtained by Coleman believe that a small trephine opening plus tap, or tap and the introduction of a small soft rubber catheter as a drain will result in the cure of the great majority of solitary brain abscesses. A second group, which appear to comprise the otologists and the majority of neurosurgeons, use a much larger opening in the bone, incise or excise the cortex down to the abscess wall, evacuate the pus under direct vision, and either pack the abscess cavity with iodoform gauze and rubber drains or leave it wide open and thus invite herniation. The advantages of the first method are that the abscess is drained with a minimum of destruction of the overlying cortex, which reduces the neurological sequelæ, and with the least possible disturbance of the brain adjacent to the abscess, which renders the spread of encephalitis about the abscess less likely. The definite disadvantages of this method are the possibility of imperfect drainage and lack of relief of the increased intracranial pressure because the trephine opening is entirely too small to afford it. The advantages of the second method are adequate drainage and relief of pressure. Its disadvantages are chiefly destruction of the cortex which may perpetuate or even increase the neurological symptoms and result in severe sequelæ. Furthermore, this method cannot be used when a deep-seated and heavily encapsulated abscess is encountered.

Grant in 1938 reviewed the records of 31 cases of brain abscess followed for at least a three-year period. Twenty-three had been treated by simple tap or tap and drainage through a small trephine hole in the bone. Five of the patients had neurologic sequelæ which kept them from working at their original occupations. The remaining 17 had no physical impairment. Eight had had the abscess attacked of necessity through a large opening in the bone with destruction of the cortex overlying the abscess. Seven of these patients were so crippled as a result that a return to their former economic status was out of the question.

Several facts have emerged as a result of the experiences of the last fifty years. With the exception of the acute metastatic abscess which may demand urgent drainage (King), brain abscesses are not generally considered surgical emergencies. It is true that too long delay may be just as fatal as too early surgery resulting in a spread of encephalitis, because of rupture of the abscess into the ventricle or because of a sudden increase of the intracranial pressure. Furthermore, only too often cases are admitted to the hospital in serious danger from increased intracranial pressure, and demand immediate drainage. However, for the

most part when the formation of an abscess is suspected, the surgeon has learned to wait for encapsulation before operating. This waiting period can be well spent in eliminating the infectious focus in the sinus and in determining with complete assurance the localization of the lesion. Again, much greater care is taken to prevent meningitis. The neurosurgeon for the most part operates through a clean field, while the otologist, being more experienced in working through the involved sinus, chooses this region for drainage. However, by either approach, experience now dictates that if the patient's condition permits the dura be opened and gauze impregnated with a mild antiseptic be placed against the brain for from twenty-four to forty-eight hours to create adhesions walling off the subarachnoid space. The importance of the use of sulfanilamide and its compounds in the prevention of meningitis needs no emphasis. Bucy and Rowe have shown that it is effective in the prophylaxis and cure of this heretofore almost uniformly fatal complication of a brain abscess. Soft rather than rigid drainage material is advisable because a rigid tube may penetrate the posterior wall of the abscess. Irrigation through the drainage tube is generally decried, unless it is done with extreme care to prevent increased pressure within the abscess cavity. The tube through which irrigation is carried out should be much smaller than the drainage tube to permit ready escape of the fluid.

No one of the methods described is applicable to every case of abscess. In certain instances all of them—a small trephine opening, tap, tap and drain, the enlargement of the cranial defect with cortical incision or excision down to the abscess wall, opening of the abscess and the introduction of packing, and, lastly, complete enucleation of the abscess and its capsule—may be necessary before cure is effected.

THE SURGERY OF BRAIN ABSCESS

Review of the more important details of the two types of surgical attack on a brain abscess seems indicated. The proper anesthesia for these procedures is pre-operative preparation with small amounts of morphine ($\frac{1}{6}$ gr) and scopolamine ($\frac{1}{300}$ gr) plus skin infiltration with $\frac{1}{2}$ per cent novocaine. If the patient is particularly apprehensive, avertin (from 70 to 90 mgm per kilo of body weight) may be given by rectum. Inhalation anesthetics should be avoided as they tend to raise intracranial pressure. The reviewer believes that sulfanilamide or one of its compounds should be administered in full dosage the day before operation and continued thereafter if

an organism susceptible to its effects is isolated from the abscess cavity. When the abscess is due to sinus infection the primary focus in the mastoid or paranasal sinuses should, if time permits, be thoroughly eradicated. If on neurological examination alone the localization seems exact, trephine opening is made under local anesthetics, over that area, and the dura laid back as widely as the small opening in the bone permits. Calma has pointed out that valuable information may be obtained from inspection of the subarachnoid space over the region in which an abscess is presumed to lie. When the subarachnoid space is filled with fluid, the symptoms may be due to a localized serous meningitis, the pseudo-abscess of Adson and Nielsen and Courville. If the indications for immediate puncture are not too urgent, the wound should be packed with gauze soaked in a mild antiseptic solution, or the dura, arachnoid, and pia about the opening should be coagulated with the electrosurgical unit and the incision closed. It should then be reopened in from twenty-four to forty-eight hours and a plunge made for the abscess with a ventricular cannula. If no resistance is encountered or the ventricle is entered, the localization is incorrect. Inasmuch as current neurological signs have been proved of uncertain value, air studies may now be justified. However, since ventriculography in the presence of a brain abscess is not without a certain risk, the reviewer believes that it should be employed only after routine methods of localization have failed.

However, if a definite sense of resistance is obtained when the cannula is inserted, the presence of the lesion is certain. Two courses are now open. The needle is introduced into the abscess cavity, the stylet removed, and a few drops of pus are allowed to escape for smear and culture. If the smear shows but a single group of organisms in three or more high-power fields, the reviewer believes that the pus should be completely evacuated by changing the position of the patient's head and increasing the intracranial pressure by jugular compression. With the coagulating current applied to the needle it is slowly withdrawn, thus sealing and sterilizing the needle tract. The wound is now closed. Many an abscess has been cured by a single or repeated taps (Dandy, Grant, Pusepp, Spasokukotsky, Patrikios and Sbarounis, Vincent *et al*).

If the pus contains many organisms on smear, small rubber tube (Coleman) is inserted into the abscess for drainage. The trephine opening and the dural incision will require slight enlargement to facilitate passage of the tube. The tube should

be introduced before withdrawal of any amount of pus, otherwise the accurate introduction of the tube cannot be ascertained by the escape of pus through its lumen. The special needle and sleeve described by Grant is of value in inserting the tube into the capsule. The tube should be placed within the cavity, care being taken not to introduce it too far lest it come in contact with the posterior wall of the abscess and possibly penetrate it. The tube is now sutured to the galea and cut off at the level of the skin. The wound is loosely closed around the tube. The dressing is built up around its mouth to prevent obstruction by overlying gauze. The tube is left *in situ* for a week, then the suture is cut and the tube allowed to extrude in the course of the next two or three weeks. Worms has suggested repeated daily aspiration of pus through the tube, and Frey confirms his statement that drainage is improved in this way. The reviewer has never been able to obtain pus by aspiration and does not believe in irrigation through the tube except with extreme care. Postoperatively it is important, for the first few days at least, to keep the patient's head in that position which will facilitate drainage. If intracranial pressure appears as a threatening postoperative complication, it may be controlled by saline laxatives or hypertonic solutions by vein, by repeated tap of the ventricle contralateral to the abscess, or if these measures fail, by a contralateral subtemporal decompression.

Coleman emphasizes, and in this we are in hearty agreement, that if after the passage of the brain cannula into the abscess the subsequent introduction of the drainage tube seems difficult, any attempt to force it into the capsule should be avoided. The cavity should be drained through the needle as thoroughly as possible, the cannula withdrawn, and several days allowed to elapse before another attempt to introduce the tube is made. Coleman reports 26 cases of solitary encapsulated abscess with 21 recoveries following this method of tap and drainage through a small opening. Grant reports 30 recoveries among 30 cases of abscess of this type.

In the reviewer's opinion, the surgical procedure just described is applicable to any abscess in any area. Certain deep-seated, heavily encapsulated cerebral abscesses are difficult to treat by any method. In cerebellar abscess these maneuvers are particularly useful, because the heavy muscles overlying the occipital bone make wide exposure difficult. A cerebellar abscess is usually small and deep-seated and not often heavily encapsulated, lending itself better to tap or tap and drain than to wide open exposure.

The second or open method of draining an abscess has been adopted by the majority of operators. Once the capsule of the abscess has been identified by the exploring cannula, the skin incision is enlarged either as a longer straight incision or in a three-legged Isle-of-Man fashion (King). The pericranium is stripped off the bone and the trephine opening widened to a size of about 4 by 4 cm. The dura is now opened in a stellate fashion in segments from the center outward, so that the openings in the dura and bone are about equal in size. The subarachnoid space is sealed off by packing narrow salvage gauze soaked in one-fourth strength tincture of iodine between the dura and arachnoid for twenty-four hours (Bucy), by suturing the dura to the cortex with fine catgut sutures (King and Adson), or by coagulating the dura, arachnoid, and pia to the cortex with the electrosurgical unit (Cahill and Horrax). The cortex is now either incised (Adson and McKenzie) down to the abscess wall, or excised and removed with the electrocautery or suction (Bucy, Kahn, King, Tobey, Bagley), until the surface of the abscess capsule is exposed. The surrounding brain is held back by gentle retraction against sponges soaked in a mild antiseptic solution. After pus has been evacuated through the exploring needle to avoid contamination of the wound, the abscess cavity is opened, the edges of the incision are retracted, the remaining material is sucked out under direct vision, and the inner wall gently cleaned of adherent masses of necrotic matter. The whole extent of the abscess is thus exposed and diverticula, if present, are opened up. The abscess cavity is now packed, and kept open with salvage gauze, which may or may not be impregnated with antiseptic material. McKenzie simply places a fairly large, soft rubber tube in the cavity without gauze. Robison fills the cavity with long strips of rubber tissue. Adson and Bucy use iodoform gauze, packing it about two small, soft rubber catheters in the center as drains. King uses iodoform gauze alone without rubber drains. He avoids drains, for he fears that they may penetrate the posterior wall of the abscess. All the operators who use gauze bring the ends of the packs out of the cavity all about the circumference of the opening in the bone, thus protecting the incised surface of the brain from infection and further walling off the subarachnoid space. Mosher suggested a conical wire-mesh basket as a drain which fits snugly into the abscess cavity, holds it open, and thus permits efficient drainage. The open end of the wire mesh is sutured to the skin to hold it in place during the early days of healing. At the end of four or five

days the suture is cut, the drain is loosened by rotating it, and it is gradually allowed to extrude itself. Cahill reports successful cure of 12 consecutive cases of abscess, 9 cerebral and 3 cerebellar, all otogenous in origin, all chronic and encapsulated, with the use of this drain. Kaplan describes 5 cases in which the patients recovered, although in 2 of them the wire-mesh drain did not function successfully and had to be removed. Horrax evacuates the pus, opens the capsule, pulls it upward into the defect in the bone, and sutures it to the galea or pericranium, thus marsupializing the abscess and using the capsule to protect the cut brain surface and the subarachnoid space. Light packing is used in the cavity. Muck calls attention to changes in the size of the abscess cavity when first opened, with shift in position of the patient's head. The insertion of drainage, especially in an abscess low down in the temporal lobe, can thus be made much easier.

Kahn has recently made an important suggestion. The presence of the abscess capsule is identified by the exploring cannula, the opening in the bone is enlarged, and the dura is opened. All the pus is evacuated through the needle, and 5 cc of thorotrast are introduced. The exploring cannula is now removed, iodoform gauze packed against the surface of the brain, and the skin lightly sutured. The thorotrast in the abscess cavity outlines its size and position roentgenographically. Subsequent roentgen-ray studies of the abscess show that it slowly progresses outward toward the surface of the brain beneath the opening in the bone. One abscess was actually found beneath the skin, having been forced outward through the defect. As a rule, however, the cortex herniates through the operative wound as the abscess migrates toward the surface. This extruding brain is removed by suction, the abscess cavity being opened, evacuated, marsupialized, packed, and drained. Kahn has had success in 3 of 4 cases treated in this manner.

In all of these variations of the open method of treatment, removal of the gauze packs begins after the first week. King irrigates his packing continuously with an azochloramide solution, but Adson, Bucy, and Horrax do not use irrigation. Removal of the gauze begins on the fifth post-operative day and is completed by the tenth or twelfth. Care is necessary in removal of the gauze lest damage be done the abscess wall. The gauze should be moistened during withdrawal to loosen its too firm adhesion to the capsule. If rubber drains have been inserted, they are freed from their suture at the skin margin as the last of the gauze is withdrawn. Within the next two weeks

the drains have usually been extruded spontaneously by the closure of the cavity. The reviewer agrees with King that the postoperative dressings of an abscess should be done personally by the operator and not turned over to an assistant. These wounds need constant supervision by a single well-trained observer. A shift in the responsibility may easily result in disaster. Herniation of the brain through the wound should be checked at the skin margin by the intravenous administration of glucose and a saline laxative. Mild dehydration, elevation of the head of the bed or lumbar puncture. If in spite of every effort the ventricle ruptures into the wound with a leak of the cerebrospinal fluid, the foot of the bed should be elevated fluids should be forced (from 4,000 to 5,000 c.c.m. in twenty-four hours) and the leak should be allowed to continue (Huey). If meningitis accompanied by a spreading encephalitis, spontaneous cessation of the leak will result. McGuckin reports 3 such cases. Sulfanilamide is always indicated under these circumstances.

Careful nursing is of extreme value in every case of abscess. Nutrition must be maintained at all costs. The bowels should always be kept free. Mild sedatives are indicated, for the more rest these patients can have the better the results will be.

A cerebral fungus is a very awkward complication of brain abscess. Usually it is due to spreading encephalitis which forces the brain outward through the craniectomy and causes strangulation of the extruded tissue by pressure against the dura. A fungus may reach a very large size in a short time if the infection behind it is acute. Prevention is better than cure. When it occurs repeated lumbar puncture, ventricular tap, or even a contralateral subtemporal decompression may be necessary to control pressure. Increase in the size of the opening in the bone and dura about the base of the fungus (Akoin) may reduce the edema due to interference with venous return. Conservative treatment and careful protection of the fungating mass by vaseline-gauze dressings and a surrounding gauze doughnut are indicated. Amputation at the base is, in the reviewer's opinion, of little use unless at the same time an abscess is entered and pus evacuated. Amputation in our experience has usually resulted in rapid reappearance especially in the acute cases. In the chronic cases the surface may be painted every second day with a 1 per cent solution of formaldehyde. An eschar is slowly formed. As it contracts and as the intracranial infection clears up recession gradually occurs (Holmes, Punsepp). Once the eschar has formed the application of perforated

adhesive strips across the dome of the fungus to make constant pressure against it will help in causing it to recede (King).

Certain types of abscess in certain areas are especially difficult to cure. Abjournine, Malbouret, and Petit Dutailh, in discussing post-traumatic abscess, review 91 cases, among which were 32 frontal abscesses with 9 deaths (28 per cent), 24 parietal with 14 deaths (58.3 per cent), 8 temporal with 3 deaths (35.6 per cent), 14 occipital with 5 deaths (35.6 per cent) and 4 cerebellar with no deaths. Brakin reports 12 frontal abscesses with 10 deaths (83.3 per cent), 18 parietal with 11 deaths (61.1 per cent) and 8 occipital with 3 deaths (37.5 per cent). As has been noted, a post-traumatic abscess is prone to be chronic and heavily encapsulated. The formation of thick capsule has made cure by ordinary drainage methods very difficult. The wall is so heavy that it does not collapse after evacuation of the pus. In the reviewer's experience a frontal-lobe abscess due to sinus disease, especially in the ethmoid and sphenoidal, is very prone to be adherent to the dura over the sphenoid ridge. In consequence of this adhesion the abscess always remains deeply seated and satisfactory drainage with eventual cure is difficult to accomplish.

In 1918, without recounting any details, Farpent stated that he had deliberately attacked heavily encapsulated post-traumatic abscesses with a technique similar to that used in extirpation of a tumor and had removed them *en masse* without rupture in 5 cases. Morton in 1932 reports that Dott had had a similar case and Cairns, in 1934, stated that complete removal is the only way in which these heavily walled lesions can be successfully handled. Isolated reports of total extirpation of a presumed tumor which later on section turned out to be an abscess appeared from the neurosurgical clinics. Adson, and Yasaka, Grant, and Groff record such cases. However, Vincent and his group in France have been the first to advocate the deliberate removal *en masse* of an encapsulated brain abscess and to insist that if sufficient time were allowed to elapse the abscess wall would acquire the proper consistency to make complete extirpation practical. Their various reports contain details in 3 cases, in 10 of which the patient recovered. Among these abscesses 7 were frontal and 3 temporal. In 9 instances the localization was verified by ventriculography. A single cerebellar abscess was thus removed, but unfortunately the patient did not recover. In every case the abscess was subacute or chronic. 7 patients with cerebral abscess died.

The technique consists in accurate localization of the lesion as a primary step. A bone flap is turned down over the area indicated and through a small incision in the dura an exploring cannula is introduced. When this encounters the capsule, the amount of pressure necessary to penetrate the wall determines the next step. If the capsule is thin and easily penetrated, Vincent believes that it would be too fragile to permit of complete extirpation without rupture. Consequently, the abscess is drained, the needle removed, the nick in the dura sterilized and closed by coagulation, and a muscle graft is implanted. A decompression for temporary relief of intracranial tension is afforded by removal of bone at the base of the flap, and a trephine opening is made in the bone flap over the incision in the dura for future tap of the abscess if this is required. The flap is now replaced but not secured except by skin suture. No drainage is necessary. Vincent claims that adequate relief of pressure can be obtained without opening the dura if the overlying bone is removed. He substantiates this claim by illustrative cranial roentgen-ray films which show elevation of the bone flap in spite of the fact that the dura had not been opened. If the symptoms recur and the bone flap is elevated by pressure, the abscess is evacuated through the trephine hole with careful estimation of the amount of pressure necessary to penetrate the capsule. When the abscess wall is sufficiently firm to make it seem probable that complete removal without rupture can be carried out, the original incision is reopened, the bone flap reflected, the cortex is incised or excised down to the abscess, and the abscess is dissected out *en bloc*. In 3 cases the capsule was found to be so firm to the exploring cannula at the time the first osteoplastic flap was turned down that immediate removal was done. However, in 8 cases one or more taps were necessary before the capsule had become sufficiently strong to justify complete extirpation. In all these cases, following total ablation of the abscess, the dura was carefully closed, the flap replaced, and the skin sutured without drainage. When it is realized that the weight of most of these abscesses varied between 100 and 150 gm and that the postoperative convalescence in the majority of cases was no more stormy nor prolonged than would have been the case if a tumor of equal size and in the same position had been removed, this method of Vincent's should be given careful consideration. To the reviewer these results are a direct confirmation of his opinion that delay to permit the abscess to become walled off and encapsulated is the most important single requirement if a surgical attack on a lesion of this

type is to be successful. Furthermore, the reviewer is surprised that he and others have been able to produce apparent cures in cases of brain abscess by single or repeated taps without the introduction of drainage. Judging by Vincent's report, a tap simply relieves intracranial tension temporarily, permits the better formation of the abscess capsule, increases the chronicity and, at times, the size of the abscess, but never actually results in complete sterilization and healing.

A review of the literature concerning brain abscess shows unquestionably that the best surgical results follow drainage after encapsulation has occurred. Adson, Bagley, Bucy, Cahill, Coleman, Davidoff, Grant, Horrax, Kahn, Kaplan, King, McKenzie, Mayfield and Spurling, and Vincent have published series of cases limiting their statistics for the most part to the surgical results with solitary encapsulated abscess. Admittedly, these figures do not represent the total mortality, for cases of acute abscess and of abscess contiguous to the mastoid accompanied by the frequent and serious complications of otogenic infection have for the most part been omitted. However, the figures show that if circumstances permit delay until encapsulation occurs, the mortality consequent upon drainage of a solitary discrete abscess should not exceed 20 per cent. However, it is the reviewer's opinion that while these selected case series show a relatively satisfactory mortality rate, if neurosurgical or otological consideration was taken of every case admitted to a clinic, in which a final diagnosis of brain abscess was made by operation or autopsy, whether that abscess was acute or chronic, adjacent or metastatic, solitary or multiple, and regardless of complications or the patient's condition on admission, the average mortality from brain abscess would be about 40 per cent.

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SURGERY OF THE THORAX

CHEST WALL AND BREAST

Fitzwilliams, D C L A Plea for a More Local Operation in Early Breast Carcinoma *Brit M J*, 1940, 2 405

Many years ago the author suggested a local operation for early carcinoma of the breast. This conservative procedure has begun to receive recognition, especially in the United States where the radical operation originated.

The author describes an early carcinoma, in the sense that he uses the term, as "one in which there is a faintly perceptible something in the breast—hardly a lump and certainly not a tumour. It has no well-marked textbook characteristics of malignancy. These tumors have one invariable characteristic which is all important for diagnosis—they throw a shadow on transillumination with a strong light." Transillumination is the only method by which they can be diagnosed.

The author states that he has overstepped the limits of safety as laid down by himself, and has done local operations in some cases in which the skin had just begun to be dimpled.

One hundred and twenty eight patients were subjected to the local excision by the author, only a small segment of the breast being removed. However, only 93 of these were found to be suitable for this procedure, and the following statistics are based on these.

Five patients were lost sight of, but of this group, 1 was known to have been well for nine and one half years, 1 for eight years, 1 for three and one-fourth years, and 1 for one and one half years.

Of the remaining 88 patients, 47 were reported to be living with no recurrence. The period of survival in this group ranged from two and one half to four teen and one half years. Fifteen patients had metastases, 12 local and 3 distant. Twelve patients died of intercurrent disease, their average survival period being seven years. The longest survival period was eighteen years. Fourteen died of carcinoma, 3 with local recurrence, and 11 with metastases.

FARL O LATIMER, M D

TRACHEA, LUNGS, AND PLEURA

Dick, J C Carcinoma of the Bronchus. An Investigation Into the Incidence and Pathological Features of 131 Cases from Glasgow Royal Infirmary. *Glasgow M J*, 1940, 134 63

The article is divided into 5 sections, namely, introduction, general features, features of the different histological types, metastases, and the summary.

The bronchus is now recognized as one of the common sites of carcinoma. The incidence in the ten year study was shown to be at its peak in 1935. The number of cases of carcinoma of the bronchus in

which autopsy was made is compared with the total numbers of autopsies and of admissions in the five-year periods from 1909 to 1938. In this period the incidence of bronchial carcinoma has more than doubled as judged by the most conservative estimate, i.e., the percentage of admissions, and in view of the more general classification in the earlier years may be considerably more.

The age incidence is given, which shows that more than 85 per cent of the patients were between the ages of forty and seventy years. The youngest was twenty-one years. There is considerable difference in the age incidence in the various histological types.

The site of the carcinoma in the bronchial tree was in the upper bronchus in nearly one half of the cases and on the right side in three-fifths of them.

Pulmonary tuberculosis, silicosis, occupation, and the presence of adhesions are discussed in relation-ship to the cause of bronchial carcinoma.

The following different histological types are considered in some detail: small round and oat-celled carcinoma, adenocarcinoma, anaplastic adenocarcinoma, small round and oat-celled adenocarcinoma, spheroidal celled carcinoma, squamous carcinoma, adenocarcinoma with squamous metaplasia, carcinoma of the lung alveoli, and conditions not classified. The summary of the distinctive findings in the different histological types are as follows:

TABLE I — CARCINOMA OF THE BRONCHUS

Type	Age	Sex	Marked Silicosis	Metastases	Duration
(a) Small round and oat celled	Average	48 M 9 F	0 of 57	Widespread	Great variation
(b) Adenocarcinoma	Average	1 M 4 F	All	Widespread	Variable
(c) Anaplastic adenocarcinoma	Marked variation	15 M 2 F	2 of 17	Numerous and wide-spread	Long
(d) Mixed (a) and (b)	Average	3 M 2 F	2 of 5	Widespread	Usually over six months
(e) Spheroidal	Average	All Males	1 of 7	Widespread	Very short
(f) Squamous	Older	All Males	None	Present in all	Short
(g) Mixed (b) and (f)	Rather older	All Males	5 of 9	Widespread (2 with none)	Average five months
(h) Lung	Old	All Males	None	Not marked	Fairly rapid

SUMMARY

One hundred and thirty-one cases of bronchial carcinoma which came to autopsy at the Glasgow Royal Infirmary in the years from 1920 to 1938 are discussed as to frequency, increased incidence, age and sex incidence, and distribution in the bronchial

tree. Various possible etiological features are reviewed.

Histological examination showed considerable diversity of types, and several of the groups possessed special characteristics, as follows:

1. Small round and oat-celled carcinoma as the commonest variety.

2. Spheroidal-celled and squamous carcinomas ran the most rapid course.

3. Carcinoma of the lung alveoli and squamous carcinoma occurred at later age than the other types and only in male subjects.

4. Anaplastic adenocarcinoma ran a longer course than the other types.

Metastases occurred very frequently and in 24 cases caused the clinical symptoms, the primary condition being silent.

CARL R. STENROD, M.D.

Marano, A., Cardena, A. F., and Matera, R. H. Anatomopathological Considerations on 5 Cases of Associated Pulmonary Cancer and Tuberculosis (Consideraciones anatómicas y patológicas sobre 5 casos de asociación de cáncer y tuberculosis pulmonar). *Rev. Soc. med. argent.* 949, 54, 73.

The authors state that in recent work Frommel has reported 5 cases of primary cancer of the lung demonstrated anatomicopathologically. 3 of which were associated with pulmonary tuberculosis. 2 of these presented cancer and tuberculosis in the same lobe and 2 in the same lung. H. showed that tuberculosis is not connected with the terminal cachexia of the cancer patient but precedes cancer by several years, and he concluded that tuberculosis is a pre-cancerous disease pointing out that in most cases cancer appears in torpid, non-evolving tuberculous lesions. Others have drawn the same conclusion.

The authors have observed 5 cases of primary cancer of the lung, 3 of which presented at the same time proved pulmonary tuberculosis. In 3 of the 5 cases, the two diseases were found to be associated in the left lung and lobe the cancer was found in the right lung and the tuberculosis in the left lung in 2 of the remaining cases, and the cancer was found in the left lung and the tuberculosis in the right lung in the other case. Macroscopically the following forms of cancer were observed: hilar in 3 cases, and nodular of the pex, lobular and mediastinopulmonary in 1 case each. Histologically the forms were typical cylindrical in 3 cases, atypical cylindrical in 1 case and epidermoid of malpighian type in the other cases. The tuberculosis presented the following forms: fibrocavous in 3 cases, and exudative tuberculous bronchopneumonia, and cavernous and fibrous tuberculosis in 1 case each. Examination of tubercle bacilli after guinea-pig inoculation was positive for 1 case and repeatedly negative for the remaining 4 cases.

In extrapulmonary tuberculous lesions were found which would reveal recent or an old tuberculous invasion in spite of the marked cachexia presented by the patients this is in accord with the

previously observed fact that the neoplastic cachexia does not promote the propagation of the tubercle bacillus. The association of the two diseases was not seen in the remnant or the nearby metastases in any of the cases. In the patients in whom the association of the two diseases occurred in the same lung and lobe, the tuberculous lesions, in spite of their exudative type did not present the active and progressive character proper to them, but the neoplasm always predominated clinically and anatomicopathologically. Finally the authors think that the tuberculosis did not play any part in the course of the carcinoma in their cases, but that each process evolved separately.

RICHARD KINZ, M.D.

HEART AND PERICARDIUM

King, E. S. J.: Artificial Collateral Circulation in the Heart: Some Critical Comments on Its Use. *Australian & New Zealand J. Surg.* 1949, 19.

Several methods have been suggested for dealing with the problem of myocardial disturbances resulting from coronary disease. One of the most important of these has been the attempt to produce a new circulation by way of adhesions induced between the heart and other structures. King presents a number of observations which have an important bearing on the problem.

The peculiar distribution in the heart of the affected muscle and, incidentally, of the scar tissue is considered very significant. These linear areas or scars probably correspond to muscle planes or parts of them and usually lie in the deeper layers of the heart; that is, they are separated from the epicardial surface by a band of relatively normal myocardium. Their form, however, is the important feature and this importance is independent of their relationship to anatomical layers.

In the majority of post-mortem specimens the principal evidence of previous ischemia is scar tissue found in three distributions: (1) in some cases, particularly recent occlusions of relatively large vessels an area involving the whole thickness of the wall, but more or less localized; (2) one area may be affected; (3) in others, the scar tissue has a laminar arrangement corresponding in distribution to the various heart muscle layers and (4) in still other cases a number of small, more or less discrete fibrous areas may be scattered throughout the myocardium.

Types of lesion may be encountered in the type in which the ischemic tissue is on the surface, and that in which it is deeply situated and separated from the surface by an area of relatively normal myocardium. The passage of blood from one group of vessels to another depends upon difference in intravascular pressure; thus, if the heart is normal such flow will not occur from grafts toward the heart. If the superficial layer of the heart is ischemic, blood may flow from an extracardiac structure in, and thereby supply the heart muscle and, if the affected

tissue lies deep in the heart wall, blood will not flow from an extracardiac structure to the superficial layer and cannot reach the affected tissue. Consequently, in many cases an artificial collateral circulation will not be effective.

King believes experimental work supporting the value of a surgically produced collateral circulation must be critically examined before its significance can be assessed. Clinical cases in which there is apparent improvement after operation have been observed, but King is convinced that such improvement is almost certainly due to factors other than the formation of a new circulation.

EARL GARSIDE, M D

Graham, E. A. Aneurysm of the Ductus Arteriosus, with a Consideration of Its Importance to the Thoracic Surgeon, Report of 2 Cases *Arch Surg*, 1940, 41, 324

The author reports 2 cases of aneurysm of the ductus arteriosus which did not give evidence of aneurysm before operation. Although this is a rare condition it is probable that because of the great interest in thoracic tumors the condition will be encountered more frequently in the future than it has been in the past.

The possibility of an aneurysm of the ductus itself, or of the pulmonary artery developing as a complication of the patent ductus may be an argument in favor of surgical closure of recognized patent ductus.

The first patient was a man of thirty-one years who complained of a cough of several years' duration and recent hemoptysis. On x-ray examination a mediastinal tumor about 10 cm. in diameter projecting to the left of the aortic arch and filling the upper third of the left lung field was found. The aortic arch and trachea were dislocated to the right. There was a dense ring of calcification which practically surrounded the tumor. The roentgen diagnosis was mediastinal tumor (dermoid cyst with cardiac and tracheal dislocation).

The tumor was exposed by means of an anterior incision through the second, third, fourth, and fifth costal cartilages. It was firm and fixed. It could not be mobilized satisfactorily and, under the impression that the lesion was perhaps a malignant teratoma, it was incised. Marked hemorrhage occurred which was controlled only with difficulty. The heart stopped beating and was started again after cardiac massage, the intracardiac injection of adrenalin, and the transfusion of blood. Shortly after the chest was closed, however, the patient suddenly stopped breathing and the heart stopped beating. All efforts to revive him were unsuccessful.

Autopsy findings showed the right aortic arch with left subclavian artery as the last main vessel coming from the arch, aneurysm of the partially obliterated ductus arteriosus, and patent foramen ovale.

The tumor which was attached to the arch of the aorta was roughly spherical and measured 11 by 8 by 7.5 cm. It had a rubbery elastic feel and a

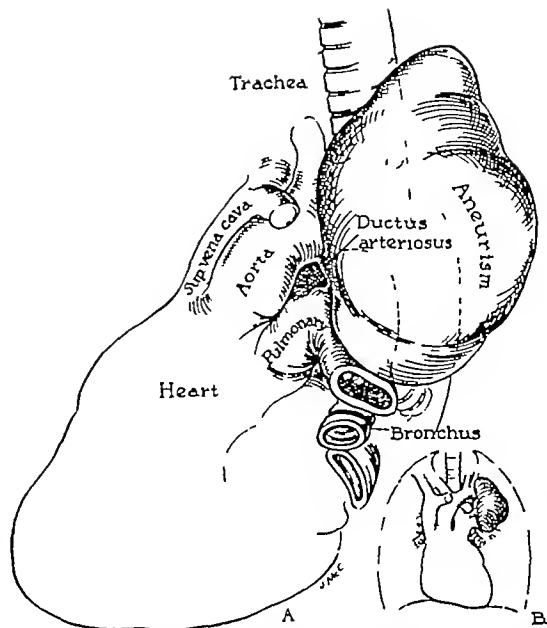


Fig 1 Diagram reconstructed in Case 2 to show the mechanism of the position of aneurysms of the ductus arteriosus posterior to the trachea. The large drawing is a lateral view. The inset is an anteroposterior view. An aneurysm of the ductus pushes itself out between the pulmonary artery and the aorta to assume a left lateral and posterior position.

covering which was formed of a thin plate of irregularly calcified tissue. Posteriorly and medially the tumor rested on the bodies of the upper thoracic vertebrae which were eroded by the pressure from the tumor. An opening 2 cm. in diameter on the lesser curvature of the aorta communicated with the tumor. On the anterior superior surface of the pulmonary artery was a small partially obliterated stump of the ductus arteriosus which had been severed at operation or autopsy. This communicated with the tumor directly.

The second patient was a man of twenty-seven who complained of wheezing spells, shortness of breath, and cough on exertion. The symptoms were said to have followed an automobile accident seven years previously at which time he sustained a blow on the chest.

X-ray studies showed a rounded, pedunculated tumor at the level of the pulmonary conus, anterior to the spine and posterior to the trachea. Pulsation was thought to be transmitted rather than expansile.

Pre-operatively, the diagnosis was tumor of the posterior mediastinum, perhaps neurofibroma.

At operation a tumor the size of an orange was found wedged between the aorta and the pulmonary artery. The mass seemed to pulsate and blood was readily aspirated from it. No further dissection was done for fear of rupturing the sac (Fig 1).

The most important diagnostic feature is the location of the tumor in the superior mediastinum in the region of the pulmonary conus, posterior to the trachea. Other varieties of mediastinal tumors seldom are found in this location. On the basis of probability one should suspect a tumor in this region of being an aneurysm of the ductus arteriosus. Recognizable expansile pulsation and abnormal heart sounds need not be present. The fact that neither case gave any evidence of disturbance of the recurrent laryngeal nerve is remarkable. The author predicts that some day an aneurysm of the ductus arteriosus small enough to be removed may be encountered.

JOHN A. GIRA, M.D.

MISCELLANEOUS

Bloomfield, A. L. Dysphagia with Disorders of the Heart and Great Vessels. *Am J M Sc.*, 940, 200-289

Dysphagia may occur in connection with the following disorders of the heart and aorta: dilated left auricle, pericarditis, sacular aneurysm, dissecting aneurysm, and anoculous aortic arch. Pressure on, and compression of the esophagus occurs frequently in the above conditions, yet dysphagia is relatively uncommon except with sacular aneurysm or anomalous aortic arch.

The author presents a case of dysphagia associated with compression of the esophagus by an enlarged left auricle in detail. The anatomical relations resulting in this condition are nicely illustrated.

He reviews the literature on dysphagia associated with cardiac disorders and makes the following pertinent observations:

1. Difficulty in swallowing with pericarditis suggests large pericardial effusion.

2. Marked dysphagia with aneurysm suggests false sac or a huge lesion threatening rupture.

3. Dysphagia in a supposed case of coronary occlusion should arouse suspicion of dissecting aneurysm.

LEWIS H. WOUR, M.D.

Adams, R. L. Evaluation of Pulmonary Function Tests in the Determination of Risk Prior to Thoracic Surgery. *J Thorac Surg*, 904, 5-633

There are so many factors that influence the vital capacity of an individual that the determination of vital capacity is of little help in estimating the operative risk of patients with pulmonary disease.

Analysis of the oxygen and carbon dioxide in the blood are too burdensome to be of practical clinical benefit.

Bronchoscopic spirometry is the simultaneous volumetric measurement and gas analysis of respiratory air from each lung separately. It gives considerable accurate information as to the function of each lung, but is very trying on the patient. It has only a limited clinical application in the determination of the function of each lung in which an irreversible collapse operation is contemplated.

Determinations of the venous pressure have not been made extensively and have not proved to be adequate for testing pulmonary function.

Electrocardiography has the same prognostic importance in lung surgery that it has in surgery of any other region.

The author concludes that we have no simple functional tests that are very helpful in determining the operative risks of patients with thoracic disease. The surgeon must rather depend on careful physical examinations and observations of the patient to determine the operative risk. His clinical experience is his best guide.

JULIAN A. MOORE, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Zieman, S A Fallacy of the Conjoined Tendon
The Etiology and Repair of Inguinal Hernia
Am J Surg, 1940, 50 17

The author made a careful anatomical study of the inguinal regions of 20 presumably normal cadavers and found the conjoined tendon discernible as a distinct structure in only 2 specimens. This frequent absence of the structure is due to the fact that the

tendinous portion of the transversus abdominis is often absent and does not join that of the internal oblique to form a conjoined tendon. The etiology of inguinal hernia is not, then, primarily a defective conjoined tendon, and the most important step in repair is not that of suturing this tendon to the inguinal ligament.

The author thinks that the transversalis fascia is a more constant and important structure than the transversus abdominis muscle or the conjoined ten

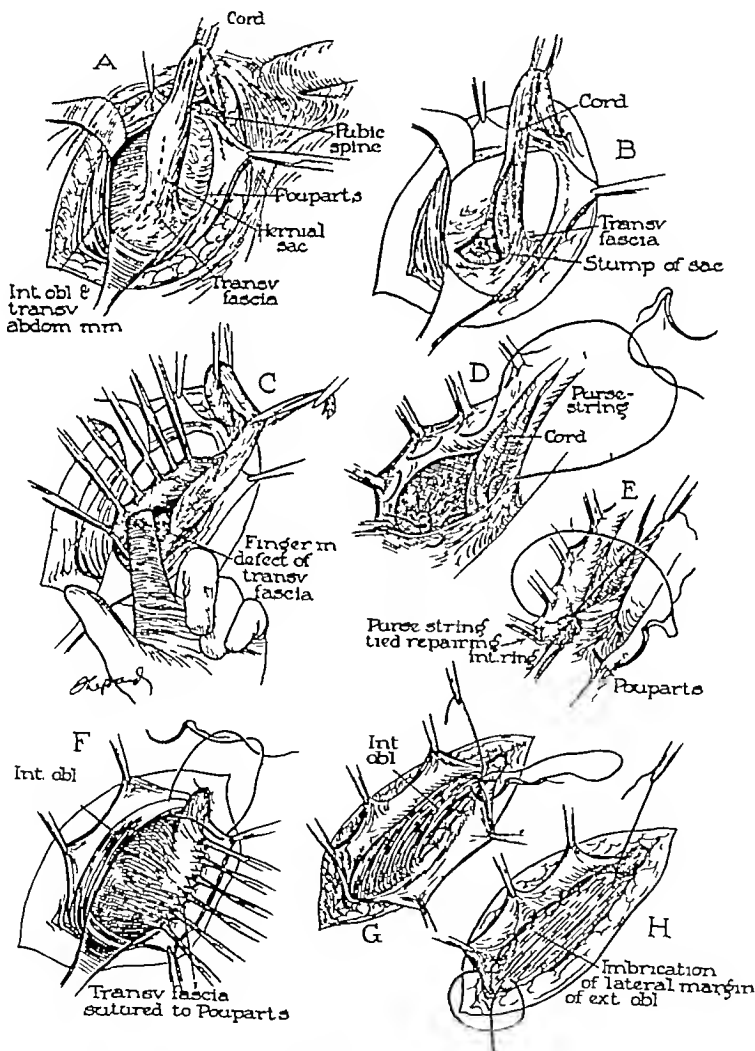


Fig 1 Successive steps in author's method of repair for indirect inguinal hernia
(Courtesy of J B Lippincott Co)

don, and that a defect in this structure is the usual etiological factor in inguinal hernia, whether direct or indirect. On these grounds he describes a method of repair of indirect inguinal hernia, the most important step of which is suturing this defect in the transversalis fascia with a purse-string suture. The repair is completed by imbricating the remaining layers (Fig. 1)

RICHARD WARREN, M.D.

GASTRO-INTESTINAL TRACT

Wangstensten, O. H., Varco, R. L., Hay, L., Walpole, S., and Trach, B.: Gastric Acidity Before and After Operative Procedures, with Special Reference to the Role of the Pylorus and Antrum. *Ann. Surg.* 940, 626.

This study is an effort to assay the effects of gastro-enterostomy, antral excision, extensive gastric resection, tubular resection with and without gastro-enterostomy and the Schmilinsky operation on gastric acidity and gastric evacuation. The gastric acidity, gastric emptying time, gastric evacuation time, and the amount of stomach removed were recorded in 60 patients, pre-operatively and post-operatively.

In 39 cases of gastro-enterostomy the reduction in gastric acidity was slight and no patient was achlorhydric to histamine. The emptying and evacuation time was short, which probably explained the temporary good results after gastro-enterostomy.

Of the 6 cases of excision of the antrum and pylorus, all operated on for massive hemorrhage, none developed achlorhydria to histamine, developed gastro-jejunal ulcer.

In 11 cases extensive gastric resection with removal of the antrum and pylorus was done and all were achlorhydric to histamine at some time or other, the emptying times were rapid, and no gastro-jejunal ulcers developed.

Extensive gastric resection with exclusion of the antrum was done in 6 cases, but with the exception of 1 which was achlorhydric to normal doses of histamine, they were not suitable for study because the operations were too recent.

The Schmilinsky operation, which provides for total intragastric regurgitation of bile and pancreatic juice, was performed in 3 cases. One patient is doing quit well, although the emptying time is slow and the others died of acute postoperative ulcers, one from hemorrhage and the other from perforation. The conclusion is that this is a poor operation.

Eight tubular excisions of the corpus and fundus with or without gastro-enterostomy were performed. Those patients who underwent gastro-enterostomy are achlorhydric to histamine, those who did not are not, but all are well.

On the basis of the studies on the amount of gastric tissue which must be removed to produce achlorhydria, it is stated that from 66 to 80 per cent must be taken. The authors believe that the failure of the Schmilinsky operation may be due to the fact that

total regurgitation of bile stimulates the gastric phase of secretion and so increases the acidity. They believe that entero-enterostomy in conjunction with high gastric resection may diminish such regurgitation and therefore be beneficial. In the series there is 33 per cent regurgitation through a gastro-enterostomy stoma, as shown by x-rays. The authors state that in general the occurrence of jejunal ulcer is from 5 to 1 per cent.

Experimental work on animals attempting to put to test Edkins hypothesis of the gastric phase of gastric secretion is reported. Most experiments showed that antral excision had no effect on the acid secretion in the fundal pouches of dogs. The suggestion that Edkins hypothesis is invalid. This conclusion is supported by the clinical evidence of cure of tubular resection that becomes achlorhydric with the antrum intact as well as by those which have antral excision and do not develop achlorhydria.

RICHARD WARREN, M.D.

Chaseoff, J., Leibowitz, S., and Schwartz, R.: An Evaluation of the Melenegracht Regimen in the Treatment of Bleeding Peptic Ulcer. *Am. J. Digest. Dis.*, 940, 71-77.

Important mortality reports in the literature as the medical therapy of bleeding peptic ulcer have been tabulated by the authors and found to vary from 4.3 per cent to 32.7 per cent. These findings are compared to Melenegracht's mortality of 4 per cent following his method of treatment. Melenegracht used a diet high in calories, containing bread, butter, tea, oatmeal, milk, various meats, fish, mashed potatoes, perked vegetables, stewed fruit, and cocoa. This was given at three-hour intervals immediately after hospitalization.

The authors treated patients by similar routine and contrasted the results obtained to those obtained in the control group of 7 patients with bleeding peptic ulcer treated with the older medical method. The mortality for the Melenegracht group was 4.76 per cent. The mortality in the control group was 25 per cent. They confirmed Melenegracht's findings that patients receiving early liberal feedings manifest "well-being" not present under the older method of therapy. The time of hospitalization was, however, not decreased by the Melenegracht regimen. In addition, 2 of the 2 cases, or 0.5 per cent, were complicated by perforation, whereas only 1 patient of the control group, 14 per cent, had a perforation. The possible role played by the increased feedings in the greater incidence of perforation merits consideration.

SAMUEL J. FOELLMEYER, M.D.

McClure, R. D. and Fallis, L. S.: Partial Gastrectomy for Peptic Ulcer. *Surgery* 940, 8-17.

The authors present a clinical and follow-up study of 74 cases of partial gastrectomy for peptic ulcer (including 3 cases diagnosed pathologically as cancer) performed in the five-year period from 1934 to 1939. They believe this operation to be the one

choice in cases of peptic ulcer coming to elective surgery because of the low mortality and the satisfactory results

In the authors' cases the age range was from twenty two to sixty-seven years and the ratio of males to females 9 to 1. According to the pathological data there were 47 duodenal and 22 gastric ulcers. There were 5 marginal, gastro-jejunal, or jejunal ulcers. The average duration of symptoms before operation was seven and one-half years. Definite indications for operation were (1) cicatricial pyloric obstruction, (2) perforation, usually into the head of the pancreas, (3) persisting acute hemorrhage, (4) a history of recurrent hemorrhages, (5) suspected malignancy of gastric ulcer, (6) a gastro-jejunal ulcer, and (7) recurrent activity after comprehensive and adequate medical treatment. Relative indications for operation were (1) a poor economic status which made adequate medical treatment difficult, (2) a poor intelligence quotient causing inability to follow the medical regimen, and (3) the major type of nervous problem interfering with successful medical treatment.

The types of operation were as follows: Polya (60), Finsterer (7), Billroth II (5), unknown (1), and sleeve resection (1). There were 4 deaths, all from peritonitis, 2 of them due to leakage of the duodenal stump, 1 to injury to the common bile duct, and 1 to kinking of the jejunum proximal to the stoma.

The follow-up statistics, which are not final because 31.4 per cent of them are of less than six months' duration, show excellent results in 48.6 per cent of the cases, good in 30 per cent, fair in 4.2 per cent, poor in 8.6 per cent, and unclassified results in 8.6 per cent.

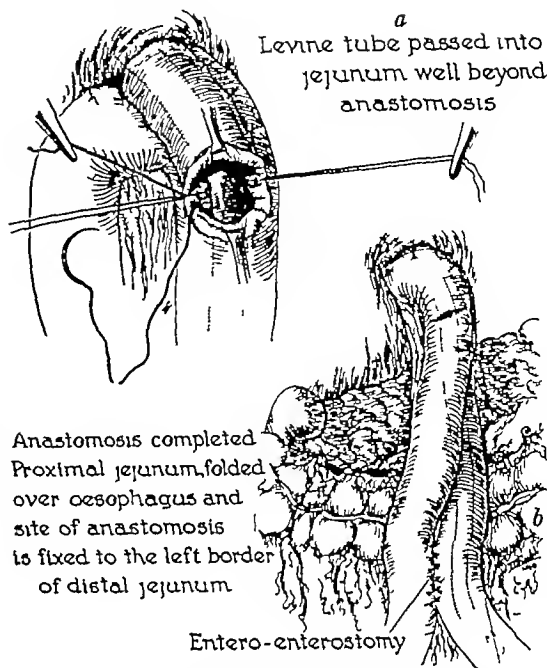
RICHARD WARREN, M.D.

Graham, R. R. A Technique for Total Gastrectomy. *Surgery*, 1940, 8: 257

Many physicians and a few surgeons believe that the operation of total gastrectomy is a very questionable procedure. This belief is due to the very high immediate mortality directly attributable to the operation. In addition, most of the surviving patients ultimately die from metastases from the primary growth. The dietetic restrictions which most patients must observe may be incompatible with happiness and freedom from gastro-intestinal discomfort. The first two objections are valid. The third is debatable.

The enthusiasm which the individual surgeon displays for this operative procedure must depend largely upon his philosophy of life. If such philosophy demands that all efforts be used to prolong life, even though the effort be accompanied by grave immediate risk, and though the patient will ultimately die from carcinoma, provided he live long enough, then such a surgeon must be an advocate of total gastrectomy.

The author's experience with total gastrectomy in 19 cases represents efforts to restore continuity between the esophagus and the rest of the gastro-intestinal tract by many combinations and permuta-



Figs. 1a and b. When the posterior layer of mucous membrane sutures is completed, the Levine tube is passed down farther into the distal jejunum well past the esophagojejunal anastomosis and the anterior layers of the anastomosis are completed. The proximal jejunum is then folded over the front of the esophagus and the esophagojejunal anastomosis and united to the lateral margin of the distal limb of the jejunum. By this maneuver the esophagus and the esophagojejunal anastomosis are completely encircled by the jejunal loops. This contact of peritoneum to peritoneum ensures healing to a greater degree than the contact of the bare esophagus to the jejunum. This maneuver completely obstructs the proximal jejunal loop and makes an entero-anastomosis necessary. During this anastomosis the Levine tube is passed farther down into the distal jejunum to make possible direct jejunal feeding early in the patient's convalescence.

tions of anastomoses between the stomach, duodenum, and jejunum. The mortality until recently has been due almost entirely to the technical difficulty of securing a satisfactory anastomosis between the esophagus and jejunum. The technique presented here has been carried out in 6 cases, and in none of these has the primary cause of the still appalling mortality been due to the esophagojejunal anastomosis. Only 1 patient in this group of 6 is still alive and well nineteen months after operation. Of the remaining 13 who underwent total gastrectomy, 4 survived. This mortality does not make the author proud of his results, but it is presented to show the tenacity of purpose which was due to the firm belief that every effort should be made to extirpate a gastric carcinoma, which if left *in situ*, would inevitably be fatal. In 7 of the 19 cases, or 36.8 per cent,

there was no evidence of extension of the disease beyond the stomach.

The details of the operative procedure are as follows:

The abdomen is opened by displacing the upper right rectus muscle laterally by a right paramedian incision. Once must be certain that there is no extension of the carcinoma into the liver or lymph glands, which would render complete removal impossible. If the disease is limited to the stomach and adjacent lymph nodes, then adequate exposure is essential. Transverse division of the left abdominal wall midway between the ensiform process and the umbilicus is a great asset. The left lobe of the liver is next mobilized which adequately exposes the entrance of the esophagus through the diaphragm. The greater and lesser curvatures of the stomach are mobilized and the omentum is divided just distal to the pylorus. The closure of the duodenal stump demands meticulous care. When the stomach is freed from the duodenum, it is wrapped in gauze tied with heavy tape. By downward traction, the stomach being used as a lever the finger is inserted between the esophagus and the opening of the diaphragm. This will permit mobilization of the esophagus to a surprising degree, while additional blunt gauze dissection will make it possible to draw down the esophagus further 3 in. below the opening in the diaphragm. Next, the jejunum is sutured to the under surface of the diaphragm by interrupted sutures after the suggestion of Allen. A point in the jejunum about 15 in. from the duodenojejunal flexure is selected and the jejunum is brought up in front of the transverse colon to be fixed to the diaphragm. The procedure advocated by Allen adequately fixes the jejunum and prevents the weight of jejunal contents from being a factor in creating tension on the new esophagojejunal anastomosis. With the jejunum firmly anchored to the diaphragm, the intradiaphragmatic portion of the esophagus is then fixed by means of interrupted sutures to the anterior surface of the distal limb of the jejunum. Usually three or four of such sutures on either side are sufficient; the most distal suture on both sides being held in hemostats to act as guy sutures. The esophagus may then be divided, great care being taken to keep up continuous suction with a Levine tube which has been passed into the stomach before operation. The Levine tube is now withdrawn to a point in the esophagus just proximal to the line of division. Interrupted sutures unite the posterior wall of the esophagus to the anterior wall of the jejunum. The esophagus is next divided and the jejunum opened. After the posterior layer of the anastomotic suture has been completed, the Levine tube is passed down into the distal jejunum. The anterior layers of the anastomosis are completed in the usual manner, which makes a very satisfactory end-to-side stoma between the lower cut end of the esophagus and the anterior wall of the distal limb of the jejunum.

When the anastomosis is completed, the proximal jejunal loop is then rolled laterally across the

esophagus and sutured to the left lateral margin of the distal limb of the jejunum. This completely surrounds the intradiaphragmatic portion of the esophagus with the jejunal loops, and very firmly covers and supports the end-to-side jejunoesophageal anastomosis as indicated in Figure 12. Since this maneuver completely retracts the proximal jejunal loop, an entero-enterostomy must be carried out between the proximal and distal jejunal loops. The Levine tube is passed on into the distal limb of the jejunum beyond the entero-enterostomy. The abdominal wall is closed in layers without drainage. The interrupted sutures employed are silk sutures although catgut may be used.

During the operation, a blood transfusion of 500 c.c.m. is given. The fluid balance is maintained by the intravenous administration of 5 per cent glucose in 500 c.c.m. of saline solution and a second infusion of 1,500 c.c.m. of 5 per cent glucose in distilled water twice in the twenty-four hours. The patient receives no food or fluid by mouth. The oral cavity is sprayed with liquid paraffin. After twenty-four hours 10 per cent glucose is administered and can be introduced into the jejunum through the Levine tube by the drip method at the rate of 35 c.c.m. per hour. At the end of forty-eight hours, the type of tube feeding and management is advocated in the treatment of gastric ulcers is applicable here.

JOHN W. NUNN, M.D.

Flint, J., Horwitz, A. and Clark, J.: A Clinical Study of the Plasma Volume in Acute Intestinal Obstruction. *A. S. Surg.* 940, 1944.

In experiments on animals with uncomplicated obstruction of the small intestine, fall in the volume of the circulating plasma sufficient to account for death has been observed. The evidence is clear that this loss of plasma may occur in the absence of dehydration or the accumulation of significant quantities of fluid in the cavity or wall of the intestine or in the peritoneal cavity. While the administration of large quantities of fluids and electrolytes does not halt the loss of plasma, the injection of small or smaller amount of plasma not only maintains the plasma volume but prolongs the life of the animal. Decompression of the intestine halts the loss of plasma volume and may permit substantial recovery of the fraction lost. Distention of the colon and gall bladder does not cause significant plasma loss while distention of two feet of small intestine may do so.

Nine cases are presented which demonstrate clinically the truth of the above assertions. Obstruction of either mechanical or paralytic type resulted in marked loss of the circulating plasma volume. In 8 cases presenting ileus of the small intestine, the average loss of plasma was 7.4 per cent, whereas in 1 case of obstruction of the large bowel, there was practically no loss at all. Moreover the amount of loss was roughly proportional to the distention, as estimated roentgenographically and by physical examination.

At the present time the plasma loss cannot be accounted for on the basis of fluid or electrolyte imbalance or on the basis of effects directly referable to the site of the obstruction, and therefore we are obliged to assume the existence of some other process as yet undiscovered, which is set in motion by the increase in intra-intestinal pressure.

JOHN WILTSE EPTON, M D

Besser, E L The Cause of Death in Cases of Mechanical Intestinal Obstruction, Consideration of Certain Confused Issues and a Review of the Recent Literature *Arch Surg*, 1940, 41 970

A survey of the tremendous amount of literature on the cause of death in cases of intestinal obstruction results in a confusing picture in which conflicting opinions present themselves concerning many phases of the problem. This fact led the author to write the present article, in which he gives a careful résumé of the experimental studies carried out since Cooper's review of the subject in 1928.

The author points out that in most instances of clinical obstruction and in the various types of experimental obstruction, death occurs before gross perforation of the intestine has taken place, and under these circumstances the cause of death cannot be satisfactorily explained by the autopsy findings. For many years it was generally believed that the cause of death from all types of obstruction was "toxemia," that is the absorption of some toxic substance from the gastro-intestinal tract. Recent studies, however, indicate that in different types of obstruction different mechanisms may operate to cause death—different physiological and pathological alterations take place.

In case of high obstruction the preponderance of evidence tends to indicate that death is due to the loss to the body of the secretions of the upper part of the intestine, the essential constituents being water and sodium chloride. While there is as yet no universal acceptance of this concept, it is supported by the extensive experiments of most recent investigators. Thus, the fact that life can be markedly prolonged by the replacement of sufficient amounts of water and sodium chloride, and only these substances, substantiates this contention. Moreover, recent experiments in which the intestinal secretions were shortcircuited around the obstruction likewise uphold this contention.

In cases of low intestinal obstruction the opportunity for reabsorption is present. While dehydration and electrolytic loss may account for death in some instances, these factors do not seem adequate to explain death in the majority of cases. Here the general consensus is that death is due to the absorption of toxic materials. There is some experimental evidence that abnormal absorption occurs in the presence of obstruction, but the relation between the intoxication and the mucosal changes is not definitely established. Thus, many investigators contend that toxic absorption does not take place until

there are definite microscopic changes in the intestinal mucosa, while others believe that selective absorption of the mucosa may be changed before any pathological change becomes visible. Recent studies indicate that death in cases of low ileal obstruction occurred in the absence of marked changes in the intestinal mucosa. Dehydration and electrolyte loss may have been a factor in those instances in which mucosal changes were not evident, however, this has not been definitely established. Most experiments tend to show that no transperitoneal absorption of the intestinal wall takes place as long as it is viable. With increased intra-intestinal pressure there appears to be a decrease in absorption of substances normally absorbed by the intestine and pressure has not been shown to cause absorption of most substances that are not normally absorbed.

It is true that lymphatic absorption is increased in cases of intestinal obstruction, and certain substances are absorbed through the lymphatics that are not absorbed by the normal tissue. There is no conclusive proof, however, that absorption of a lethally toxic material occurs in this manner.

In general there is no satisfactorily substantiated evidence of toxic materials in the body fluids in cases of low ileal obstruction. Experimental animals with low ileal obstruction die in a state of "shock." While there is a decrease in blood and plasma volume which certainly is of some consequence, yet the precise rôle that this factor plays is not definitely known. Although the nature and origin of the toxic material in obstructed contents are not clear, the preponderance of evidence suggests that the toxicity of this material is dependent on bacterial activity, and, although multiple toxins may be involved, part of the toxicity seems to be caused by the presence of histamine or a closely allied substance.

MATHIAS J SEIFERT, M D

Wangensteen, O H The Problem of Surgical Arrest of Massive Hemorrhage in Duodenal Ulcer *Surgery*, 1940, 8 275

Massive hemorrhage is a not uncommon cause of death in duodenal ulcer. Approximately 10 per cent of patients treated conservatively for massive hemorrhage of ulcer origin die. The lives of a number of such patients may be saved by timely surgical intervention. The recovery of 5 of 7 patients subjected to ante-mortem operation for the control of hemorrhage suggests, in the main, that such patients stand operation tolerably well if the bleeding is adequately controlled. A means of uncovering the bleeding point, dealing with the open vessel, and a manner of securing satisfactory closure of the duodenum are described.

It is pointed out that a fall of the blood pressure to a shock level, necessitating transfusion of large quantities of blood to maintain the pressure at 100 mm Hg, suggests that the patient has an open vessel. In massive hemorrhage from duodenal ulcer the gastroduodenal artery is eroded, because of per-

formation of the posterior duodenal wall. The ulcer itself is often occult, presenting usually even if operation during active hemorrhage no tabular signs until the perforation is uncovered. Patients with duodenal ulcer who bleed slowly to low levels of hemoglobin (from 30 to 40) without manifesting significant falls in the blood pressure do not exhibit complete perforation of the duodenal wall nor do they have a hole in a large vessel; they usually present erosion of the small vessels within the bowel wall.

The most difficult question to decide is when operation should be undertaken. One can say in which patients bleeding will cease automatically. The longer the bleeding period before operation, the more serious the risk. The patient with massive hemorrhage who bleeds to shock level, and in whom it is difficult to maintain satisfactory blood pressure should be submitted to immediate operation, as soon as the blood loss is replaced adequately. Other patients Flasterer's dictum of waiting forty-eight hours to determine whether bleeding will cease spontaneously is sound advice. However, until the hazards of massive hemorrhage become known more generally it is not likely that patients with threatening hemorrhage will come to operation early.

JACOB M. MOXA, M.D.

MILLER, E. M., FEIL, E. H., BROCK, C., and TODD, M. C. Acute Appendicitis in Children. *J Am M A* 940, 5, 39.

The authors report clinical study of 63 cases of acute appendicitis and its common complications, observed in the Children's Surgical Ward of Cook County Hospital, Chicago during period of six years.

All patients with acute appendicitis and its common complications, whether children or adults, are classified in one of three groups.

Group 1 comprises all patients with acute perforated appendicitis. Immediate appendectomy is the only treatment indicated in all cases of this type unless the tract is obviously abscessing. Immediate operation upon 67 patients was associated with no deaths, and none of these patients was treated conservatively.

Group 2 includes all patients with the clinical characteristics of an appendiceal abscess. These patients have usually been ill for several days. They have moderate fever and marked leucocytosis, but they are not desperately ill. There is palpable abdominal mass which, regardless of its size or position, represents pathologically slow leak from the appendix that has allowed sufficient time for the body defense processes to wall it off from the general peritoneal cavity. These patients should be treated conservatively. Twenty-five patients of this type were operated upon for drainage, with mortality of 8 per cent. Twelve and three patients were treated conservatively with mortality of 5 per cent. In all but few cases careful observation will reveal gradual improvement in the clinical picture

and a progressive diminution in the size of the abdominal mass, until at the end of from four to six weeks it is no longer palpable. These patients should return to the hospital in approximately three months for appendectomy. Very few cases will exhibit progressive aggravation of symptoms and enlargement of the mass. In these the mass will usually point to some place where it can be easily and safely drained.

Group 3 includes patients who have spreading peritonitis. These patients are very sick. The abdomen is distended and tense, and there is generalized tenderness. The appendix has perforated into the general peritoneal cavity too suddenly for the establishment of an adequate defense. Many of these perforations result from the obstructive type of appendicitis.

Patients in this last group should be operated upon immediately, allowing only time for adequate preparation by the correction of fluid and electrolyte imbalance, relief of distention, and the replacement of the lost plasma protein. In the cases of 23 patients treated in this manner the mortality was 12.5 per cent. Twenty-five were treated conservatively with a mortality of 80 per cent.

The technique of the more operative procedure for patients with peritonitis is briefly described. The McBurney incision is almost always employed. Cultures of the free pus are made when the peritoneal cavity is opened. The Poole suction tip is used instead of gauze sponges. The perforated appendix is delivered with Babcock forceps. The stump is always ligated with catgut suture, if possible, is inverted with a catgut purse-string suture. Drains of the moist cigarette type are placed as near to the source of infection as possible. Judicious postoperative treatment attempts to restore to the circulating blood all elements that have been depleted by the infectious process.

EDWARD W. GIBBS, M.D.

BERROW, W. and OCHSNER, A. The Treatment of Appendiceal Peritonitis. *J Am M A* 940, 5, 345.

A scientific study of 2039 New Orleans Charity Hospital patients with acute appendicitis led the authors to formulate the following definite principles.

The problems of acute appendicitis are the prevention and treatment of appendiceal peritonitis.

Prompt removal of an inflamed appendix before perforation has occurred is imperative.

There is no conservative treatment of acute appendicitis without perforation.

Procrusteanism and catharsis are the greatest factors in causing perforation and death.

Operative intervention is the treatment of choice for patients with suspected appendiceal peritonitis even when the diagnosis cannot be established with reasonable certainty.

Less harm is done by incision through the abdominal wall of a patient with appendiceal peritonitis than by omission of such procedure in the presence

of intestinal obstruction or a small, slowly leaking, perforated peptic ulcer

An appendix should not be removed in case of appendical peritonitis if adhesions must be broken down, and especially not if the process is walled off. The only exception to this rule is if the appendix lies immediately beneath the incision, is not adherent to surrounding structures, or presents a gross perforation at its base through which intestinal contents continue to leak.

The ultimate outcome of appendical peritonitis depends upon the conflict between the patient's infection and his defensive powers.

If there is doubt about perforation, exploration should be done. The majority of patients with generalized appendical peritonitis exhibit generalized abdominal pain, absence of peristalsis on auscultation, rebound tenderness referred to the point of palpation of the left side of the abdomen, tenderness on both sides on rectal or vaginal examination, and distention—the absence of peristalsis and abdominal distention are the most reliable points of diagnosis. Occasionally, in cases of twenty-four hours' duration one or more of these symptoms may be absent after localization has begun, and, conversely, a patient whose appendix has not ruptured may present problems suggestive of appendical peritonitis. Therefore, without exception, an acutely inflamed appendix entering the hospital within the twenty-four-hour period was removed regardless of clinical signs of perforation or generalized peritonitis. When perforation occurs in the twenty-four-hour period, the defensive mechanism is too poorly organized to cope with infection. After from seventy-two to ninety-six hours these perforations are usually largely sealed by omentum or surrounding intestines.

Conservative treatment has its place, if properly carried out.

The patient must be kept quietly in bed to favor localizing processes. Too many and too vigorous manipulations and examinations may be disastrous. Elevation of the head end of the bed will favor localization of secondary abscesses, if any, in the pelvis where they can be detected and drained easily. Absolutely nothing should be given by mouth. Distention is minimized by inhalation of concentrated oxygen and by constant gastric suction of the type advocated by Wangenstein. Decompression of the small bowel by means of the double tube suggested by Miller and Abbott is of great value—especially adynamic ileus can be combated satisfactorily by its use together with continuous suction. Intra-gastric suction is also used to prevent the accumulation of fluid in a poorly functioning gastro-intestinal tract.

Morphine sulfate ($\frac{1}{6}$ gr) is given every three hours unless respirations are less than 14 per minute, this is an aid because of its tonic action on the intestine and sedative action on the patient. Fluid-salt balance is maintained by intravenous infusion twice daily. Adrenocortex extract is of inestimable value in combating the toxemia and aiding maintenance of the electrolyte balance. Multiple small transfusions

help to combat anemia and hypoproteinemia. Recently the authors have come to believe that sulfanilamide in an 0.8 per cent subcutaneous infusion is of value in the treatment of appendical peritonitis. Appropriate treatment of secondary intraperitoneal abscesses is an important part of the conservative treatment.

A critical review of results obtained in appendicitis in different large municipal hospitals of the West Coast, the Middle West, and the South Central States revealed that they were practically the same as the authors'.

The authors give the following summary.

Among 860 patients with uncomplicated acute appendicitis the mortality was 0.8 per cent, among 179 patients with acute appendical peritonitis it was 27.3 per cent.

Of 15 patients with appendical peritonitis seen within twenty-four hours after the onset, 12 had prompt appendectomies with 3 deaths, 2 of the 3 treated conservatively also died.

Of 92 patients with appendical peritonitis seen from twenty-four to seventy-two hours after the onset, 61 had immediate operations with 15 deaths, 5 of the 31 treated conservatively died.

Of 62 patients with appendical peritonitis seen three days after onset, 21 had immediate appendectomies with 10 deaths, 3 of the 41 treated conservatively died.

The authors believe that exploratory laparotomy is the best procedure when the diagnosis of acute appendicitis is not reasonably certain, when there is doubt about perforation, and when the cases are seen within twenty-four hours of the onset of symptoms.

MATHIAS J. SEIFERT, M.D.

Arnheim, E. E. Diverticulitis of the Colon, with Special Reference to the Surgical Complications. *Ann Surg*, 1940, 112: 352.

The complications of diverticulitis of the colon requiring surgery are listed as follows: (1) peritonitis resulting from the passage of organisms through inflamed diverticula without perforation, (2) perforation of inflamed diverticula with peritonitis or abscess, (3) fistula formation, including fistulas between the colon and abdominal wall, colon and bladder, or colon and another portion of the intestine, (4) peridiverticulitis, resulting in thickening of the colon, tumor-like formation, and narrowing of the lumen of the intestine, (5) metastatic suppuration, and (6) carcinoma arising from diverticula of the colon.

In 19 of 35 cases of diverticulitis of the colon admitted to Mount Sinai Hospital, New York, between 1927 and 1937, surgical complications were present. The 16 uncomplicated cases were apparently cured by medical management. Peritonitis without perforation was present in 2 cases, perforation with abscess in 5 cases, perforation with peritonitis in 5 cases, peridiverticulitis (stenosis) in 4 cases, sigmoidovesical fistula in 2 cases, and associated carcinoma in 1 case. The average age of the patients

formation of the posterior duodenal wall. The ulcer itself is often occult, presenting usually even at operation during active hemorrhage no tangible signs until the perforation is uncovered. Patients with duodenal ulcer who bleed slowly to low levels of hemoglobin (from 20 to 40) without manifesting significant falls in the blood pressure do not exhibit complete perforation of the duodenal wall nor do they have a hole in a large vessel; they usually present erosion of the small vessels within the bowel wall.

The most difficult question to decide is when operation should be undertaken. No one can say in which patients bleeding will cease automatically. The longer the bleeding period before operation, the more serious the risk. The patient with massive hemorrhage who bleeds to shock level, and in whom it is difficult to maintain satisfactory blood pressure should be submitted to immediate operation, as soon as the blood loss is replaced adequately. In other patients Finsterer's ductum of waiting forty-eight hours to determine whether bleeding will cease spontaneously is sound advice. However, until the hazards of massive hemorrhage become known more generally it is not likely that patients with threatening hemorrhage will come to operation early.

JACOB M. MORA, M.D.

MILLER, E. M., FALL, E. H., BROCK, C., and TODD, M. C. Acute Appendicitis in Children. *J. Am. M. Ass.* 1940, 5, 30.

The authors report clinical study of 63 cases of acute appendicitis and its common complications, observed in the Children's Surgical Ward of Cook County Hospital, Chicago, during a period of six years.

All patients with acute appendicitis and its common complications, whether children or adults, are classified in one of three groups.

Group 1 comprises all patients with acute unperforated appendicitis. Immediate appendectomy is the only treatment indicated in all cases of this type, unless the attack is obviously subsiding. Immediate operation upon 63 patients was associated with no deaths, and none of these patients was treated conservatively.

Group 2 includes all patients with the clinical characteristics of an appendical abscess. These patients have usually been ill for several days. They have moderate fever and marked leucocytosis, but they are not desperately ill. There is a palpable abdominal mass which, regardless of its size or position, represents pathologically a slow leak from the appendix that has allowed sufficient time for the body defense processes to wall it off from the general peritoneal cavity. These patients should be treated conservatively. Twenty-five patients of this type were operated upon for drainage, with a mortality of 8 per cent. Two hundred and three patients were treated conservatively with a mortality of 2.5 per cent. In all but a few cases careful observation will reveal gradual improvement in the clinical picture

and progressive diminution in the size of the abdominal mass, until at the end of from four to five weeks it is no longer palpable. These patients should return to the hospital in approximately three months for appendectomy. Very few cases will exhibit progressive aggravation of symptoms and enlargement of the mass; in these the mass will usually point at some place where it can be easily and safely drained.

Group 3 includes patients who have spreading peritonitis. These patients are very sick. The abdomen is distended and tense, and there is generalized tenderness. The appendix has perforated into the general peritoneal cavity too suddenly for the establishment of an adequate defense. Many of these perforations result from the obstructive type of appendicitis.

Patients in this last group should be operated upon immediately, allowing only time for adequate preparation by the correction of fluid and electrolyte imbalance, relief of distention, and the replacement of the lost plasma protein. In the cases of 35 patients treated in this manner the mortality was 2.8 per cent. Twenty-five were treated conservatively with a mortality of 80 per cent.

The technique of the above operative procedure for patients with peritonitis is briefly described. The McBurney incision is almost always employed. Cultures of the free pus are made when the peritoneal cavity is opened. The Poole suction is used instead of gauze sponges. The perforated appendix is delivered with Babcock forceps. The stump is always ligated with catgut and, if possible, is inverted with catgut pursestring suture. Drainage of the soft cigarette type is placed as near to the source of infection as possible. Judicious postoperative treatment attempts to restore the circulating blood elements that have been depleted by the infectious process.

EDWARD B. GROSS, M.D.

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presenting complicated cases was fifty-one years, while the age of those presenting uncomplicated cases was sixty-nine years. A case of diverticulitis of the colon in an eighteen-hour-old infant is among those reported, this being the youngest patient on record.

The sigmoid was the most frequent site of disease, but in a cases there was perforation of diverticulum of the splenic flexure of the colon. The operative mortality in the cases with surgical complications was 68 per cent. This group included 4 patients who were either too seriously ill to warrant operative interference or who refused surgery. Most of the deaths were due to peritonitis which was advanced at the time of operation. One patient died after being subjected to surgery without adequate pre-operative therapy. Two patients died following resection with primary end-to-end anastomosis.

HAROLD LACRYAR, M.D.

Finochietto, R., and Esperma, P. Anal Sphincter; Plastic Operation for Partial Incontinence (Esferma anal plástica por incontinencia parcial). *Arch. argent. de enferm. d. par digest.* 1940, 5, 500.

The external anal sphincter consists of three superimposed and somewhat telescoped rings of striped muscle fibers which form truncated cone the base of which rests on the levator muscle of the anus. The external ring or subcutaneous bundle, is the thinnest; the middle ring, or superficial bundle, is thicker; and the internal ring is a real muscle of good size and ample base, the external part of which fuses with the fibers of the levator muscle of the anus. The truncated cone is hollow and contains

thick tube of circular unstripped muscle fibers which constitute the internal anal sphincter and are



Fig.

the continuation of the internal circular muscle layer of the rectum.

When the sphincter is completely cut in the treatment of anal fistula, it retracts immediately but not to the same extent in its various parts; the subcutaneous bundle being free retracts more while the superficial and deep bundles retract less because they adhere to the neighboring tissues, the fibers of the internal sphincter retract most. In unfavorable cases, the process of healing will form a bridge of fibrous tissue which will keep the extremities of the sectioned muscles separated; repair will be especially difficult in cases in which the intervention has taken place in the lateral quadrants where vessels and nerves have been sectioned. The worst cases are those in which portions of muscle have been excised.

Incontinence may be total or partial; the latter is the more frequent and is the only type considered in this study. The treatment consists of liberation of the muscular stumps and their suture under the

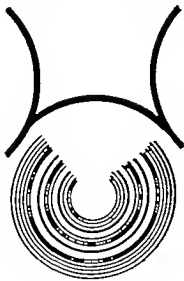


Fig.

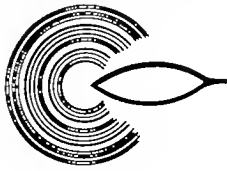


Fig. 3

best possible aseptic conditions, the asepsis being the greatest difficulty of the intervention. Three basic types of incision are used: the H-form (Fig 1), which is extramucosal, provides a good field, and is useful when the anterior or posterior raphe is involved, the semilunar (Fig 2), which is also extramucosal and serves for lateral interventions, and the elongated oval (Fig 3), which reaches the anal canal and is indicated in cases of great separation of the stumps.

Four cases are described. Careful hemostasis is indicated after each step in the operation. The stumps of the individual muscle bundles are sutured with chromicized catgut, No. 0, after they have been sufficiently liberated to avoid tension on the sutures. The skin sutures may be removed on the fourth or fifth day.

RICHARD KEMEL, M.D.

Garat, J. A. Surgical Treatment of Anorectal Fistulas (Tratamiento quirúrgico de las fistulas anorrectales) *Semana méd.*, 1940, 47, 540

Garat states that any fistulectomy requires special pre-operative care of the intestine. In patients with regular intestinal function, the colon will be well prepared by the administration of a mild purgative twenty-four hours before the operation, followed by an enema of plain water on the night preceding and in the morning three or four hours before the intervention. The usual practice of constipating the patient is condemned. A barbiturate should be administered on the eve of the operation to calm the patient. The perineal region should not be shaved, but the hair should be carefully cut with scissors; this is to be followed with a warm, soapy sitz bath. As sacral block anesthesia is indicated to insure deep and extensive regional anesthesia, the patient may take a cup of coffee or tea on the morning of the operation.

The basic requirements for the success of any fistulectomy are the exact determination of the principal tract with its primary and secondary openings and its collateral ramifications, and the determination of the anatomical relationships between the primary and accessory tracts and the sphincteric apparatus. The first requirement will allow complete extirpation of the fistula, and the second will show what part of the sphincter will be involved by the operation and to what degree the function of intestinal retention will be jeopardized. The complete exploration of the fistula must be done during the operative period because it requires superficial and deep perineal anesthesia. Instrumental exploration is better by far than injection of dyes or of contrast substances, the passage of which may be blocked by a vegetating granuloma, a foreign body, or a spasm of the sphincter. In addition, instrumental exploration does not interfere with the surgical act, as does the injection of foreign substances, and may be done gradually while the operation is going on. An anorectal retractor and flexible silver probes having an olivary tip are the instruments required for this purpose.

The author always begins with the exploration of the anorectal mucosa because he thinks that, as the fistulas originate at this level, it is more important to discover the primary opening first of all. Then he continues his investigation, using two or more probes. During the operation, he always completes his investigation carefully through the tracts that have already been incised. Various general rules have been established by different authors to guide the surgeon in his preliminary exploration; these rules should not be applied too strictly in view of the great anatomical variety of fistulas. It is often very difficult to discover the primary orifice, and great familiarity with the normal and pathological anatomy of the endo-anorectal region is needed to determine this orifice with the exactness necessary for surgical success. At times it is impossible to find a primary opening because the original process has spread until it has formed a complete fistula, while resorption of part of the inflammatory process has taken place and closed the primary orifice. In these cases, it is advisable to extirpate all the crypts of Morgagni which correspond to the actual fistula, according to the rules laid down by Salmon and Goodsall. Usually, the principal tract follows the lymphatic and venous vessels of the region, as it is determined by the progression of the septic lymphangitis or phlebitis initiated at the level of the original mucosal orifice. There are anal, cryptogenic (including anterior and posterior horseshoe), and low and high rectal fistulas. The basic principle of the treatment of the fistula is excision of the entire tract, principal as well as secondary, starting at the primary orifice.

The excision must be managed so as to allow permanent drainage of the secretions and cicatrization from the bottom toward the surface. Section of the subcutaneous portion of the external sphincter and of the lower part of the internal sphincter will not jeopardize the sphincteric function. When the fistulous tract passes above the anorectal fibromuscular ring, fistulectomy becomes a serious matter because this part of the sphincter cannot be cut without permanent loss of intestinal retention, and this is much less bearable than the chronic suppuration of the fistula. To avoid the excessive use of ligatures for the control of hemorrhage after the fistulectomy is finished, it is advisable to moisten the tampon gauze with a tannin preparation in flavic solution or with tannin in 50 per cent alcohol. A soft intrarectal tube is installed to prevent premature adhesion of the borders of the wound.

Careful postoperative supervision is indispensable to success. Two or three hours after the operation, hot fomentations are used continuously until the sitz baths are started. The patient is instructed to drink large quantities of liquids. A low residue diet is given until the bowels are opened spontaneously. When the sitz baths are started twenty-four hours after the operation, the intrarectal tube is removed and the anorectal tampon is also removed between this time and the next twelve hours. From the

sixth to the eighth day when the granulation tissue is consolidated, topic applications are initiated, at first with antiseptics and later with solutions of cod liver oil to stimulate the process of healing.

RICHARD KENNEL, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Redell, G.: Operative Anastomoses Between the Biliary and Gastro-Intestinal Tracts: A Review of Earlier Literature and Clinical Study of 889 Swedish Cases. *Acta chirurg. Scand.* 940, B3 Suppl. 59.

Redell's work is complete, well arranged, and thorough. The historical and bibliographical data are clearly outlined and critically analyzed. The bibliography itself contains 17 references, and the review of these references brings to light various interesting points which are discussed.

The material which Redell himself compiled and analyzed consisted of 889 cases of operative anastomosis between the biliary passages and the gastro-intestinal tract. These constitute practically all of the operations of this kind performed in Swedish hospitals between 1904 and 1937. Although the assembling of these records represents an monumental amount of work, there is no weakness in the author's statistics, which he freely admits that is, the review of these cases represents the operative and diagnostic work of a large number of surgeons and many of the records are incomplete or ambiguous and the follow-ups are absent in many cases. Accordingly although 889 cases are recorded, many of them are worthless from a statistical viewpoint. In those cases which were available for follow-ups the author gives some valuable and interesting data, and his conclusions seem justified.

The cases are divided into two groups, and each group is analyzed with regard to the type of operation, supplementary operations, operative mortality, postoperative course, duration of life after operation, complications, and the incidence of age and sex. The groups are as follows:

Cancer of the pancreas. There are 368 cases in this group. Despite the considerable operative mortality the author believes that operation is always justified when the condition of the patient permits. A palliative anastomosis results in some prolongation of life and the intense pruritus associated with the jaundice is frequently relieved. The subsequent course of a fair number of cases diagnosed as cancer

of the pancreas proved that the operative diagnosis was erroneous. Eleven patients were living three or more years following an anastomotic operation for pancreatic cancer. Had these patients not been operated upon they probably would have died of the effects of chronic obstructive jaundice. Therefore, operation is justified in order to save this group of individuals if for no other reason. Constriction of the duodenum by tumor of the pancreas occurred in 5 cases which necessitated gastro-enterostomy

at the time of the biliary anastomosis or at a subsequent operation.

Cancer of the duodenal papilla. This occurred in 16 cases. Most of the patients in this group were helped palliatively. The outlook for the group as a whole is poor. However, the chance of success is greater in this group than in the verified pancreatic cancer group since papillary tumor can be treated radically without too serious operative risks.

Cancer of the bile ducts was present in 43 of the 889 cases. Only patients lived a year or more in this group. A study of a fair percentage of cases revealed that the biliary anastomosis had been distal to the invading tumor. Consequently the author urges that more care be exercised in determining the site and extent of the tumor before the type of anastomosis to be used is decided upon.

Cancer of the gall bladder or liver existed in 14 cases operated upon. Results in this group are poor. A rather large proportion of these cases autopsy revealed that anastomosis was done ill advisedly because of the location and extent of the tumor.

Pancreatitis. This condition accounted for 74 cases. Anastomosis in these patients was followed by favorable results both early and late. More than half of them were living and in improved health one year after operation, and many are living and well for much longer intervals. Follow-up examinations were conducted in 53 of these cases and in 17 of them the patency of the anastomosis as demonstrated roentgenologically. Many of the patients had had operative diagnosis of cancer of the pancreas, but because of the subsequent course this condition could not have existed, and consequently these cases were classified as pancreatitis.

Stricture of the bile ducts or papilla and persistent jaundice of unknown cause represented a heterogeneous group of cases, 65 in number. As a rule, the anastomosis appeared to have had the desired effect in these cases, and but rarely resulted in complications.

Stricture of the biliary or common duct are present in 76 cases. Results in these cases were rather conventionally poor and indicated that anastomoses for these conditions are rarely warranted. Signs of persistent infection and obstruction are observed in a high percentage of cases.

Accidental injuries to the bile ducts usually resulted from operative accidents, although there was one resulting from a traffic accident. Twenty cases were in this group. Complications arose after anastomotic operations in a rather high percentage of cases, and the author believes that fresh strictures constituted the main threat in these cases.

Postoperative external biliary fistulas were present in 23 cases. Subsequent anastomoses of anastomoses were followed in many instances by continued symptoms.

Stricture of the bile ducts follows diseases of the stomach or duodenum accounted for 31 of the reported cases, and in benign cases the results are fully satisfactory.

Diseases of the liver Anastomoses were done for his condition in 24 cases, and were followed by universally bad results. The importance of preoperative diagnosis is emphasized by the results in his group.

Isthmic dilatation of the common bile duct was present in 6 cases. Only 1 patient recovered completely.

An analysis of the results following the various types of operative anastomoses shows that there is no real difference between gastric and duodenal anastomoses. Anastomoses to the small intestine (duodenum and jejunum) are possibly somewhat to be preferred.

Ascending infection into the biliary tree has been raised as an objection to anastomosing operations. Only 9.4 per cent of the cases showed symptoms suggestive of this condition, and as a rule they followed ineffective anastomoses or obstruction of the anastomosis. Post-mortem findings in patients operated upon many years previously showed patent anastomoses with no gross or microscopic evidence of infection. Consequently, the author is inclined to minimize this objection to operations.

Follow-up roentgenograms in 89 cases showed reflux of the intestinal contents into the biliary tract in 62, without clinical evidence of harm in most cases. These findings are illustrated by reproductions in the original article.

Postoperative hemorrhages were not infrequent. The operative mortality was high throughout the series. The author stresses the fact that the greatest attention must be paid to preoperative as well as to the postoperative treatment.

LUTHER H. WOLFF, M.D.

Browne, E. Z. Variations in Origin and Course of the Hepatic Artery and Its Branches. *Surgery*, 1940, 8: 424.

The root structures of 280 cadavers were dissected to study the course of the hepatic artery and its branches to obtain a fair representation of what to expect in actual practice.

The nomenclature is as follows:

Common hepatic artery denotes the hepatic artery from the origin of this vessel until it divides into its terminal right and left branches.

Normal common hepatic artery is an artery arising from the celiac axis and supplying both lobes of the liver.

Replacing common hepatic artery is one which supplies both lobes of the liver, but arising from another source than the celiac axis.

Accessory common hepatic is an additional artery (one or more) supplying both lobes of the liver in addition to a normal common hepatic.

Absence of the common hepatic means that the right and left lobes are supplied separately by separate arteries. In this case the artery of the right lobe would be a replacing right hepatic and the one to the left lobe a replacing left hepatic.

These terms also apply to other arteries discussed

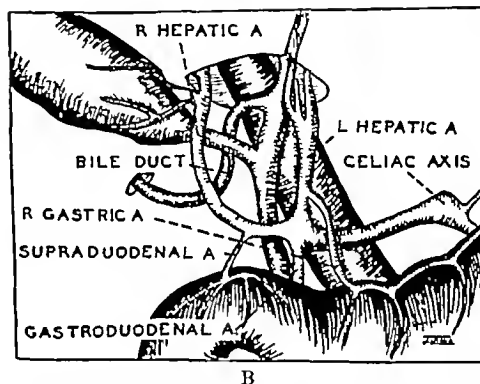
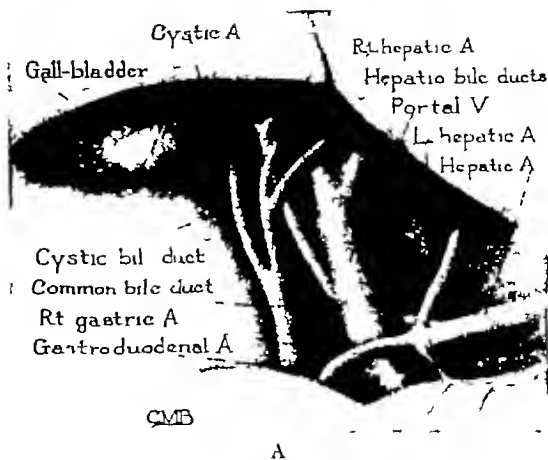


Fig 1 A, The normal right hepatic artery passes posterior to the portal vein. B, The right hepatic courses in front of the ductus choledochus and the neck of the gall bladder. A very short cystic is to be noted, also a supra duodenal branch.

Normal common hepatic arteries were present in 92.8 per cent of the specimens. Long trunks were present in 202 specimens, they divided into right and left terminal branches about 1.5 cm from the porta hepatis. These are the so-called classic type vessels of Branco. The remaining specimens had short trunks—the so-called *en bouquet* type of Branco.

The common hepatic artery was absent in 14 specimens (5 per cent). One replacing artery was present in 6 cases (2.2 per cent). Two of these arteries originated from the abdominal aorta and 4 from the superior mesenteric. One accessory artery occurred in only 1 case (0.36 per cent). Two accessory arteries were not observed in this series, and could not be found in any other series in the literature.

The gastroduodenal artery normally arises as a trunk from the hepatic artery, and immediately divides into three branches. This artery arose normally in 220 (81.4 per cent) of the specimens. Fifty-eight (26.3 per cent) of these came off of a short com-

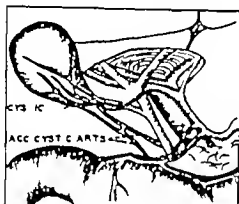
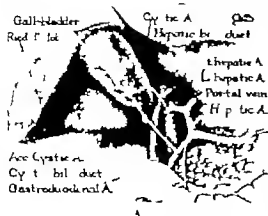


Fig. A. An accessory cystic artery from the gastroduodenal. The normal cystic courses ventral to the common hepatic duct and the accessory cystic courses in front of the common bile duct. B. Two accessory cystics, one from the aorta and the other from the superior mesenteric. These are very unusual.

mon hepatic trunk as one of the terminal branches, and 7 (77 per cent) came off as a long trunk as first branch. Sixty-two (57.6 per cent) had an anterior relationship to the common bile duct in their entire course. This is of considerable surgical importance. One replacing gastroduodenal artery was present in 44 specimens, originating from various vessels of the celiac axis.

The supraduodenal artery supplies the first part of the duodenum. It arises from the gastroduodenal artery. It is not mentioned in textbooks, but was found in 56 (50 per cent) cases in this series. Its surgical importance lies in the fact that it runs anterior to the common bile duct, and may arise from various vessels.

The right gastric artery arose from the common hepatic artery in only 4.3 per cent of the specimens, thereby making the so-called "normal" origin

appear erroneous. One replacing right gastric artery was found to be more common than the so-called normal type, as it occurred in 45 per cent of the cases. Five of these coursed anterior to the common bile duct, 4 ran ventral to the gastroduodenal artery and 26 pursued a course anterior to the common hepatic artery. This artery was absent in 25 (19 per cent) of the cases.

The left hepatic artery arose from the normal common hepatic only 53 times (66.7 per cent). One replacing left hepatic artery occurred 19 times (24 per cent). In 2 instances the anomalous vessel sprang from the celiac axis separately in 1 case from the aorta. In 1 case from the aorta by means of a replacing common hepatic and in 1 from the left gastric artery. Seventy-one (53 per cent) accessory left hepatic arteries were found. One case showed two accessory left hepatic arteries.

A normal right hepatic artery occurred in 77 per cent of the cases. Numerous cases of abnormal course were found, in 3 the artery passed behind the portal vein, in 6 it was anterior to the common bile duct, in 4 it was anterior to the cystic duct, and in 5 it was posterior to this duct. In 44 it closely paralleled the duct to the neck of the gall bladder before turning upward or back to the right lobe of the liver. This is very important from the surgeon's standpoint.

The cystic artery showed a large number of variations, exceeded only by those of the right gastric artery. Normally it courses off the right hepatic in the angle between the common hepatic and cystic ducts, just as the right hepatic artery emerges from behind the common hepatic duct. This condition was present in only 54.7 per cent. It coursed ventral to the common hepatic duct in 24 per cent of the cases, posterior to the common hepatic duct in 1 case, anterior to the right and left hepatic ducts in 3 cases, and ventral to the common duct in 7 cases.

One replacing cystic artery was present in 44 cases the origins are varied. One replacing artery was seen in 7 cases (6 per cent). One accessory was present in 53 specimens. Two accessory arteries were found in 3 instances. Multiple vessels were found in almost every 3 cases, which is of great surgical importance.

HAROLD LUTTRELL, M.D.

Ohta, F. Studies on the Detoxicating Power of the Liver (Yakriton). Ninety-Eighth and Ninety-Ninth Reports—The Difference of Urinary Elimination of Phenolsulfonphthalein Injected Intravenously in Rabbits with Different Liver Power and the Influence of Yakriton Upon It. Ninety-Eighth Report—Contribution to the Usage of Yakriton Against Experimental Chromat. Nephritis. *Tokyo J. Exp. Med.* 949, 39 95, 37.

If phenolsulfonphthalein is injected intra-venously in rabbits, the total amount of it excreted in the urine is almost the same in all rabbits, despite the strength of their liver detoxifying power. However, the rate of the dye elimination is greater in rabbits

cases of adenoma of the pancreas, which tumors were removed by operation from 3 patients: 1 Rips hospital, Copenhagen. All 3 patients had had pronounced hypoglycemic attacks unyielding to diet.

The first patient was a smith, aged forty years. At the operation an adenoma the size of a hazelnut was removed from the head of the pancreas. The microscope revealed the tumor to be many-celled, and benign, a typical insulinoma. Its insulin content was from 5 to 30 international units per gram. The blood sugar rose to 400 mgm. per 100 c.c.m. the day after the operation. On examination seven months later the patient's health and mental condition were normal. The fasting blood sugar was 97 mgm. per 100 c.c.m.

The second patient was a male textile worker aged twenty-two. At the operation two adenomas the size of big peas were removed from the tail of the pancreas. The microscope showed few-celled, benign insulinomas. Tissue cultivation did not reveal any insulin activity. The patient was well when discharged. Hypoglycemic attacks, though less pronounced than before the operation occurred again three months later. The patient is undergoing dietic treatment at present.

The third patient was a farmer, aged forty-six. At the operation an adenoma the size of a cherry was removed from the head of the pancreas. The microscope showed many-celled benign insulinoma. The insulin content was 10 international units per gram. The blood sugar rose to 500 mgm. per 100 c.c.m. the day after the operation. The health and mental condition of the patient were normal on discharge and are normal now after the lapse of two months.

The presence of the triad (1) periodic nervous disturbances when fasting in connection with (2) hypoglycemia, and (3) pronounced benefit from the ingestion of glucose, is important in the diagnosis.

Disturbances in the pituitary, adrenal, and thyroid glands, and in the liver are mentioned as other causes of hypoglycemia.

The occurrence of slight hyperthyroidism in connection with insulinoma is discussed (the third patient had a basal metabolism of from 30 to 37 per cent) and it is pointed out that insulinomas are, practically speaking, never found by roentgenography because of their position and small size.

Cases of diffuse insular hyperplasia are mentioned in connection with the operative technique.

The mortality in these operations must be regarded as low in consideration of the gravity of the disease. According to Whipple, 5 of 56 patients from whom tumor was removed died.

If attacks of hypoglycemia cannot be warded off by diet, an operation should be done. With protracted hypoglycemia irreversible changes gradually take place in the ganglia of the brain with persisting mental disturbances in consequence thereof. Furthermore, about 1 in 4 of the insulinomas so far removed have been malignant with tendency to metastasize.

Treatment with diabetogenic pituitary hormone is not advisable.

David, Y. C.: The Indications and Results of Pancreatectomy for Hypoglycemia. *Surgery*, 1940, 1, 2.

Patients having attacks of nervous or general vital disturbances coming on in fasting state associated with a hypoglycemia with readings below 50 gm. per cent and relieved immediately by the ingestion of glucose very likely have islet tumors of the pancreas. If ever before exploration of the pancreas is indicated it is necessary to exclude as carefully as is possible all other causes of hypoglycemia, such as those related to the liver, adrenals, pituitary gland, thyroid gland, sympathetic nervous system, and other conditions related to the digestive metabolism. In addition, a trial of dietary management especially in borderline cases should be carried out, care being taken that the frequent feedings do not produce excessive adiposity. When exploration is decided upon, careful search for an islet tumor must be made in all parts of the pancreas. The requires mobilization of the duodenum for a more thorough exploration of the head of the pancreas. When no tumor can be found, resection of the entire body of the pancreas up to the superior mesenteric vessels is indicated. This operation has been carried out in 7 patients with favorable results the records are available in the literature.

While instances have been reported in which tumors were found, not at the first operation, but at second operation or a tummy or in resected portion of pancreas, yet there are other instances in which no tumor was found at any time. Resection of portions of the pancreas had for its object the hope that a tumor might be found in the resected portion or that a reduction in the islet secretion might be induced by removal of hyperplastic islet tissue or considerable amount of normal islet tissue. There are 3 instances reported in the literature in which partial or subtotal resection of the pancreas as done and in which tumors were found in the resected portions of the pancreas. The results were similar to those in which the tumor alone was removed.

In a group of 7 patients who had removal of from 35 to 60 gm. of pancreas for spontaneous hypoglycemia no tumor tissue was found. The resected portion was normal in 14, hyperplastic in 2, and the seat of pancreatitis in 1. Eleven patients are relieved of their symptoms, 7 having been followed up for more than two years. There was operative death in 1 patient the condition improved and in 4 there was no improvement. There are 5 patients in whom from 4 to 60 gm. of pancreas were removed. Ten of these are apparently cured. Of a group of 8 patients from whom less than 25 gm. of pancreas were removed, 4 died, 3 were cured, 1 showed improvement in their condition and 8 showed an improvement. In the group of 23 patients from whom more than 50 gm. of pancreas were removed, the mortality rate was 4.3 per cent. In a collected series of denoma of the pancreas removed by operation the mortality rate was 6 per cent. This would indicate that resection of the pancreas is fairly safe.

as compared to simple removal of an adenoma. Better results appear to follow extensive resection of the pancreas as judged by the reports in the literature.

The resection should be subtotal. It has been suggested that four-fifths of the gland be removed, that is, from 48 to 72 gm. The amount depends on the normal range in weight, from 60 to 90 gm.

The author resected 48 gm. of pancreas in a patient with marked hypoglycemia. No tumor was found but the patient has remained well post-operatively for nearly two years.

MANUEL E. LICHTENSTEIN, M.D.

MISCELLANEOUS

Totten, H. P. The Intraperitoneal Use of Hypertonic Glucose Solution. *Surgery*, 1940, 8, 456.

This article presents the results of an experimental study undertaken to determine the value of hypertonic glucose solution in preventing the formation and re-formation of experimentally produced adhesions.

Hypertonic glucose in normal salt solution was selected for use in this study because the transudate which develops upon its introduction into the peritoneal cavity occurs consistently. By virtue of this large transudate, which is fibrin-free, mechanical isolation of intestinal coils acts to prevent the formation of adhesions between contiguous loops of bowel.

This solution, in the absence of intraperitoneal infection, is entirely innocuous except for the possible danger of dehydration, and then only if it is used in excessive amounts. Dehydration, however, may be easily controlled. This solution has an advantage over most solutions because of the fact that its sugar and salt content may be utilized.

It was found that 20 per cent glucose in normal salt solution is well tolerated in the normal peritoneal cavity. By giving an equal amount of normal salt solution subcutaneously, in order to obviate dehydration, as much as from 30 to 35 c.cm. per pound of body weight was tolerated without apparent ill effect. The tolerance beyond this limit was not tested.

Because of the fact that this solution is hypertonic, having a high osmotic equivalent, a transudate rapidly forms. With 50 c.cm. of the solution being given intraperitoneally and 50 c.cm. of normal salt solution given subcutaneously in a series of animals, the following amount of transudate was obtained from the peritoneal cavity at the designated time interval.

The method used to produce adhesions was a combination of mechanical and chemical trauma which consisted of scraping of the anti-mesenteric portion of the small intestine with a knife blade until the serosa was abraded, followed by the application of tincture of iodine.

From these experiments, it was concluded that hypertonic glucose in normal salt solution, aside from possible effects of dehydration when used in excessive amounts, is entirely innocuous when placed within the normal non-infected peritoneal cavity. A large transudate forms, which is completely absorbed within a period of twenty-four hours. This solution, when used intraperitoneally, possesses value in preventing the formation and re-formation of experimentally produced adhesions. It apparently confers a certain degree of non-specific immunity upon the peritoneum. However, in the presence of gross peritoneal contamination its use hastens the spread of infection as it interferes with fibrin formation.

SAMUEL H. KLEIN, M.D.

ADVANCES AND INNOVATIONS IN THE FIELDS OF OBSTETRICS AND GYNECOLOGY DURING THE PAST TWENTY YEARS

EDWARD L. CORNELL, M.D. F.A.C.S., Chicago, Illinois

A SERIES of special articles reviewing briefly the advances made in obstetrics and gynecology during the past twenty years, contributed by many well known obstetricians and gynecologists, appeared in the October 1940 number of the *American Journal of Obstetrics and Gynecology*—celebrating its twentieth anniversary.

SAMPSON writes on "The Development of the Implantation Theory of the Origin of Peritoneal Endometriosis. The conclusion that menstruation occurs in chocolate cysts of the ovary and produces hematomas of endometrial type, identical with those found in adenomyoma of the uterus, has been strengthened by further observations. The assumption that the fusion of an ovary containing one of these cysts with an adjacent structure is always an indication of the sealing of a perforation of the cyst is not correct. The inference that endometrial cysts actually rupture their contents escaping into the pelvic cavity has been confirmed by finding this phenomenon at operation.

At times during menstruation blood, carrying bits of mucllerian mucosa, escapes through patent tubes into the peritoneal cavity. Circumstantial evidence indicates that mucllerian tissue in this blood, under favorable conditions, becomes implanted on any structure upon which it may lodge. It may be present only on the ovary or ovaries, only on the peritoneum, or in both situations. In patients with peritoneal endometriosis associated with an endometrial cyst of the ovary both primary implants from or through the tubes and secondary implants from the cyst may be present.

If the bits of mucllerian mucosa carried by menstrual blood escaping into the peritoneal cavity are always dead, the implantation theory also is dead and should be buried and forgotten. However if some of these bits are even occasionally alive, the implantation theory also is alive.

CALDWELL, MOLOV and ESORO writing on "The More Recent Conceptions of the Pelvic Architecture, give a résumé of their classification of pelves. The authors have studied more than 3,000 cases roentgenologically and in not more

than an estimated per cent has a recognized cause for the pelvic abnormality been found. Rickets accounts for 1 per cent of all pelves studied, and the other 1 per cent is accounted for by a variety of causes. If approximately 98 per cent of all pelves are considered normal growth variants, it follows that the classification of these forms must be placed on a morphological basis and given prominence in all formal classifications.

The classification as now set forth is much more extensive and is divided into 2 main classes—morphological and pathological.

Certain roentgen methods of pelvimetry have been simplified to require not more than two films, a lateral and an anteroposterior view but while these views are adequate for the purpose of roentgen measurement, they are not satisfactory for a comprehensive study of pelvic morphology.

The authors are opposed to the use of roentgen methods of prognosis which are based on the results obtained from mathematical formulations of a few pelvic and fetal diameters. The ultimate outcome of labor depends upon many other factors. The intricate variations in pelvic shape although theoretically expressible in centimeters, cannot be so designated in practice they can only be observed and expressed in descriptive terminology.

TAYLOR, in his discussion on "Changing Conceptions of Ovarian Tumors, said that the last twenty years have witnessed unexpected progress in the study of the nature and behavior of ovarian tumors. The greatest advances have been made in those aspects regarded more or less complete. Clinical advances have followed secondarily as a result of better differentiation.

A prerequisite for any acceptable classification of ovarian tumors is that it represents as nearly as possible the general opinion of the time and not simply the private views of some individual theorist.

Then follows a classification which should be considered provisional for 1940.

FRANK reviews "Outstanding Trends in Gynecology. The advances of the last twenty years have been added by a tendency toward accuracy

and control, as shown by reliance on investigative machinery, by the employment of rigid statistical methods, by the development of standardization of bio-assay and chemical assays with the aid of physiologists and biochemists

HEALY discusses "The Treatment of Uterine Cancer" and evaluates the operative and radium and x-ray methods. Radiation methods are applicable to all cases of cervical cancer, and the end-results are superior to those obtained by operation

Critical studies of series of cases of cancer of the corpus uteri treated by radiation and surgery seemed to indicate that there are two major histological groups. One is of rather low malignant quality, known as adenoma malignum, in this group panhysterectomy by the vaginal or abdominal route may be expected to establish a permanent cure. The other is of higher malignant histological character, and in this group hysterectomy gives poorer end-results than when radiation alone or radiation followed by hysterectomy is used

WATSON, writing on "Puerperal Sepsis," says that definite advance has been made along the following lines: recognition of the part played by the anaerobes in puerperal and postabortal infection, proof that these anaerobic infections are endogenous in origin, proof that such infections are predisposed to by shock, hemorrhage, prolonged labor, and traumatization of tissue, and realization that the removal of dead and decomposing material resulting from this type of infection can, in most instances, be effected with no risk and usually with great benefit to the patient

There has also been identification of different groups of the beta hemolytic streptococcus and proof that only Group A is virulent in the human subject, establishment of the fact that infection with this organism is practically always exogenous, and proof that these organisms are usually conveyed to the patient by a carrier who harbors them in his mouth, nose, or throat

It has been demonstrated that the risk of infecting patients is practically annulled by periodic nose and throat culture of all the members of the obstetrical staff and elimination of those who are carriers, and by the complete masking of the nose and mouth of all those who are attendant upon the parturient and puerperal woman. The persistence of the organisms in the environment of an infected individual, even for long periods after her removal therefrom, has also been demonstrated

There has also been recognition of the necessity for most complete isolation of all such infected

individuals and for proper provision for this in every maternity service, and the beneficial effects of sulfanilamide and its derivatives in streptococcal, gonococcal, and bacillus-coli infections have been discovered

In "The Management of the Menopause" NOVAK states there is a definite field for both the parenteral and oral routes of administration of the estrogenic hormones, the former being much more effective when the symptoms are severe. The question of the possible hazard of inciting malignancy in individuals susceptible to cancer cannot be decided too arbitrarily in the present state of our knowledge, though it is fair to state that no impressive evidence of such a danger has as yet been adduced. Stilbestrol, because of its high degree of estrogenic activity, is very effective in the control of menopausal symptoms, but its use carries with it the disadvantage of toxicity in the considerable proportion of about 20 per cent

EHRENFEST reviews the progress made in our knowledge of "Pregnancy and Disease." He concludes that within the last twenty years knowledge of the possible influence of pregnancy and disease on each other has been greatly enriched, though it remains wanting in many respects. In medical writings the formerly customary term "pregnancy complicated by disease" is being gradually replaced by the more optimistic phrase "pregnancy associated with disease," which, of course, does not deny the possibility that such association occasionally represents a very serious complication. However, the obstetrician now is less intimidated by the presence of a maternal disease, is less inclined to proceed forthwith with termination of the pregnancy, and exhibits much more interest in the coincident disease

A careful consideration of "The Progress of Cesarean Section" from 1920 to 1940 by PHANEUF has shown that this operation is not a panacea for all obstetrical ills. The indications, which doubtless were extended because of the increased safety of the low or cervical operations, should be carefully evaluated and should be reduced to a minimum. While the general surgeon, technically, may perform a perfectly adequate operation, his training is not such that he may evaluate the purely obstetrical methods against abdominal delivery in a given case. In such instances, the requirement of a consultation with an obstetrical consultant, as is done in a large number of hospitals, will have a salutary effect in reducing morbidity and mortality. The improved results of cesarean section in the hands of the trained obstetrical specialist may not be due to the fact that

be can perform the operation better than the general surgeon, but rather to the fact that his obstetrical training has taught him the contraindications to this operation, which he observes.

FLEURY gives the history of the "Program in Endocrine Studies of Reproduction," saying this is one of the brightest chapters in medicine. It has yielded many active substances of inestimable value in therapy.

HAMBLEY writing on "The Endocrine Therapy of Functional Ovarian Failure" says that a large group of women with varying grades of spontaneous ovarian failure, with the exception of those in the climacteric ages, may be salvaged for the reproductive function by judiciously chosen and rationally administered organotherapy. Thyroid substance is most effective in patients with hypometabolism. The cyclic use of the ovarian steroids results in the initiation or restitution of normal ovario-endometrial responses in a certain group of patients. The combined and cyclic employment of equine and chorionic gonadotropins permits physiological salvage of another group of patients, those whose ovarian failure is related to hypogonadotropic activity of the pituitary gland. At present no clear-cut diagnostic criteria have been established for selecting appropriate groups of patients for cyclic steroid or cyclic gonadotropic therapy.

INYNO discusses "Modern Trends in the Artificial Termination of Pregnancy and Labor." The characteristic haste of some American accoucheurs to terminate labor is shown not only by their frequent resort to cesarean section but also by the readiness with which they effect operative delivery through an undilated cervix. The induction of labor toward the end of pregnancy when performed for a distinct indication, is most valuable procedure. Of late years, however, delivery by appointment, usually by rupture of the membranes, for the convenience of the patient and of the doctor has come into vogue with certain obstetricians. There is yet no evidence, when the cervix is effaced and there is some dilatation of the cervix and absence of cephalopelvic disproportion or of an abnormal presentation, that in the hands of a well trained obstetrician such a procedure is often productive of harm. On the other hand should prolapse of the cord occur, or puerperal infection set in, the attendant should be willing to accept the blame for an accident which probably would not have happened had he not interfered with a normal pregnancy.

According to STRICKER the present trend in embryology is to regard all parts of the embryo and its auxiliary tissues as having functions to

perform. The investigator endeavors to distinguish which of these functions are for the immediate maintenance of the organism and which produce actual developmental alterations. It is now realized that the embryo at all stages is a living individual, and is to be explained as a biological problem, rather than an exercise in purely morphological abstractions. One now begrudges the immense amount of effort that has been expended in the past on discriminating between the ectoderm, mesoderm, and endoderm cells.

RUMER concludes his article on Uterotubal Insufflation as follows.

"The method of uterotubal insufflation has undergone gradual development from its inception in 1919 to its present status as a precise and safe clinical non-surgical test for determining tubal patency. CO₂, adopted as the gas of choice, has proved its usefulness and superiority over the years. With hysterosalpingography it shares the same limitation, namely the necessity for correct interpretation which in the last analysis is an art acquired by ample critical experience. uterotubal insufflation in careful hands can be utilized without untoward immediate accidents or sequelae in all cases where it is properly indicated for diagnosis and therapy.

In the article on "The Unmarried Mother as a Medical and Social Problem," DUNNAN said that from the viewpoint of the obstetrician, it is difficult to imagine a group of patients who are more completely in need of proper obstetrical care and for whose children an efficient attempt to restore psychic normality is more necessary than these young girls who have been so unfortunate as to find themselves among the unwed expectant mothers.

The leaders in obstetrics in this country believe that the expectant mother and her infant should have the care which is due them. They do not condone immorality and they regret that any woman, particularly a young girl, should be in such a predicament. The broadening of human knowledge has brought with it great changes in the manner of dealing with problems of society.

HERRLITZKE writing on "Mycosis and Trichomoniasis" says that twenty years ago gross ignorance prevailed on vaginal trichomoniasis and vulvar and vaginal mycoses. Today these conditions are usually recognized and adequately treated although improvement in therapy should and will likely take place. To the physicians of the United States goes priority for most of the important contributions in the understanding of these entities and credit for resourcefulness in the development and improvement of therapy.

ADAIR discusses the motives back of maternal welfare. They may be succinctly stated as the preservation of the health and lives of mothers and babies, the minimizing of suffering, and the maintenance and improvement of the human race. He then gives a brief history of the movement for better care of the obstetrical case in the United States.

EASTMAN concludes in an article on "Apnea Neonatorum" that in the presence of anoxia, apnea is resistant to all types of treatment other than correction of the anoxia itself. In a recent study of experimental anoxia even convulsive doses of alpha-lobeline, metrazol, and coramine, whether injected intravenously or directly into the carotid artery, were found to have no effect whatsoever on anoxic apnea, on the other hand a few insufflations with oxygen produced immediate breathing. The main desiderata in the treatment of apnea at birth would seem to be four in number: warmth, posture, aspiration of mucus, and delivery of 100 per cent oxygen to the pulmonary alveoli.

KOSMAK, writing on "Contraceptive Practices" states that although acknowledged for centuries, the practice of contraception has assumed a different aspect during the past quarter of a century. One of the most signal changes is the acknowledgment of the responsibility of the medical profession in the application of proper and adequate contraceptive measures and their indications. A development of particular interest in recent years is the public health aspect of contraception. Both local and state organizations have given this official recognition. There is a sane and an insane approach to the problem of contraception—it is to be hoped that within another decade or two, an adequate solution may be reached.

In "The Evaluation of Hospital Statistics" WARD says that mortality and morbidity results of a hospital staff, and the percentage of successes, partial successes, and failures of certain lines of treatment are of the utmost importance in influencing the trend of practice and therefore the health of the community. The value of these percentages must be based upon the reliability and completeness of records. A successful follow-up clinic depends upon the fact that the surgeon who operated, or was in charge, will examine the patient. There is a need to establish standards for the comparison of results.

The author's experience with the employment of a professional statistician to audit results has

confirmed most positively the opinion that such a procedure is not only a great advantage in facilitating the compilation of our statistics, but is an essential warranted by the great importance of a serious problem.

"The Increase in Hospital Deliveries" is discussed by PIASS. During the past two decades there has been a marked reaction against the old traditions that babies should be born at home, each year has seen an increasing percentage of hospital confinements. This tendency has been deprecated by many older practitioners who still insist that hospital delivery is not only more expensive but more dangerous, since the patient is subjected to contact with infectious agents and other influences against which she has no effective defense.

Up to this time it has been quite impossible to evaluate the claims of the rival groups, the proponents of each concept being quite irrevocably convinced of its virtues. There are, however, certain phases of the problem which may be considered with reasonable objectivity. It may be offered that the trend toward institutional delivery is sound and its expansion inevitable, provided the hospitals continue to improve their equipment and personnel, and agree to such restrictions on individual initiative as are most conducive to the greatest safety for the mother and her child.

DICKINSON writes on "The Application of Sculpture to Practical Teaching in Obstetrics." For telling effect and minimal mental effort only three-dimensional instructions can adequately demonstrate certain bodily functions and several structural relations. Chief among these is the mechanism of delivery. And herein there is every reason for combining the high art of sculpture with scientific research, whether this instruction be intended for the medical college or for popular teaching.

DANNREUTHER writes that the achievements and progress of the American Board of Obstetrics and Gynecology since its creation have been such as to make its influence felt throughout the country. Prospective applicants for certification are preparing themselves more thoroughly for the practice of obstetrics and gynecology, hospitals are demanding certification for appointment to responsible staff positions, certain medical societies are favoring diplomates of the Board, and even the lay public is becoming aware of the implications of certification.

GYNECOLOGY

MISCELLANEOUS

Huffman J W: An Evaluation of Androgenic Therapy in Gynecological Practice. *Am J Obst & Gynec* 940 40-675

The effects in women who received androgenic therapy parallel those produced in laboratory animals by injections of testosterone propionate. Functional uterine bleeding was inhibited by the male sex hormone. In this group, no notable masculinizing changes developed, except occasional temporary hypertrophy of the clitoris. Three patients have been under observation for more than two years.

Testosterone propionate will bring about cessation of genital activity in human beings, as it has been observed to do in adult female rabbits and rats. This effect is the result of pituitary rather than ovarian inactivation. The changes produced by the male sex hormone are temporary with resumption of cyclic phenomena of the genitalia after administration is discontinued. When large doses of testosterone propionate (over 350 to 500 mgm.) are injected over a considerable period of time, temporary masculinizing changes, especially hypertrophy of the clitoris, may occur. Inhibition of activity in the lactating breast after the administration of testosterone propionate has been observed clinically and has been demonstrated histologically in animals. Reports indicate that reproduction is possible and that normal young have been born to women who have received male sex hormone prior to pregnancy.

There is considerable evidence to suggest that androgenic therapy has a place in the treatment of functional uterine bleeding, mastalgia, periperal breast engorgement and for the inhibition of lactation. Further investigation of its use in dysmenorrhea and in the treatment of menstrual molimina seems indicated. The use of male sex hormone may perhaps, be more advantageous than that of estrogens in certain selected instances of menopausal disturbances.

EDWARD L. CORRELL, M.D.

MacBryde, C. M., Freedman, H., Loeffel, E., and Castrodale D: Stilbestrol; Clinical and Experimental Studies. *J Am Med Ass* 940, 5 440.

Using stilbestrol, the authors observed definite relief of hypogonadal symptoms in 5 of 56 cases. Hot flashes were decreased in all cases in which they were a prominent complaint. Headache was relieved in 6 of 6 cases in which it had been severe and energy seemed greater in 33 of 33 patients who complained of lassitude. Pruritus vulvae was relieved in 8 of 9 cases and increased sexual desire was reported by 6 patients.

Unpleasant subjective effects, such as slight nausea and vomiting, separately or combined, occurred in 6 per cent of the cases.

Objectively vaginal menses showed active changes under stilbestrol therapy. After full vaginal smear changes were obtained at any dosage level and treatment was stopped, it took from twenty-one to thirty days for the smear to regress gradually to the castrate type. Symptomatic relief followed roughly the vaginal smear picture.

The endometrial biopsies revealed active proliferative changes after 1 mgm. etc gives intramuscularly in seven days, or after 20 mgm. etc given orally in fourteen days.

From the subjective and objective effects in this series, the authors estimate stilbestrol to be from 50 to 66 per cent as effective by mouth as by injection.

In comparing stilbestrol to diethylstilbestrol, the former was found to be considerably more active.

ARTHUR F. S. A. M.D.

Barbee, A. C.: A Method for Evaluating the Stomach of Urinary Incontinence. *Am J Obst & Gynec* 94 4 33

During the past year the author has been employing a test for the evaluation of the stress of urinary incontinence based on physiological principles. It consists essentially of three studies, all relatively easy to perform.

Measurement of intravesical pressure. With standard volume of fluid in the bladder and with the patient standing, direct manometric readings are obtained.

Direct measurement of urethral resistance. A small balloon composed of two superimposed supracots is inserted in the urethra, filled with known manometric pressure with 90 per cent sodium iodide solution, and an x-ray is taken. Studies on normal patients indicate that under these conditions the entire urethra should remain closed and should obliterate the balloon shadow. If a pressure of 35 cm. of fluid, and if it is at this pressure that the roentgenogram is taken.

Indirect measurement of internal bladder strength. This determination is also made in conjunction with the roentgenogram, the film being taken in the oblique and an indulating watch chain used to mark the course of the urethra. As this film is exposed, the patient is asked to strain downward as hard as she can. With straining, intravesical pressures of from 60 to 80 cm. of water may be obtained, so that in this study the urethra is subjected to much greater force than in the first film. But it is the force that is applied in more physiological manner from within out and.

In normal person, rise in intravesical pressure alone causes flow of fluid through the internal sphincter without detrusor contraction of the bladder. Funneling of the bladder floor toward the urethra indicates that mere increase in intravesical pressure associated with contraction of the trigone is

forced fluid through the internal sphincter, which denotes a weakening of this sphincter

The information obtained from these studies permits a much better understanding of the patient's incontinence. With such information in mind, a complete program for the treatment of partial incontinence in women should include measures designed to (a) lower intracystic pressure when this is found to be increased, and (b) re-establish urethral resistance when this is diminished

EDWARD L. CORNELL, M.D.

Furuhjelm, M. The Excretion of Estrogenic and Androgenic Substances in the Urine of Women, An Investigation of 14 Healthy Women, 10 Cases of Myoma, and 2 of Castration. *Acta obst et gynec Scand*, 1940, 20 Supp I

The excretion of estrogenic and androgenic substances was determined in two day lots of urine from 14 healthy women for at least one ovarian cycle. The same investigation was carried out on 10 women with myoma of the uterus, with the difference that the samples of urine were collected for two weeks before and two weeks after the operation, if any took place. The estrogenic substances were determined quantitatively according to a method learned by the writer at the National Institute for Medical Research in London. Mice were used as experimental animals.

The androgenic substances were determined spectrophotometrically, according to Zimmermann. Biological control experiments on capons and rats indicated that the amount of spectrophotometrically determined substances is proportionate to the amount of biological active androgenic substances.

The curves representing the excretion of estrogenic and androgenic substances in 14 healthy women reveal the following:

- 1 A typical configuration
- 2 One or, occasionally, two pronounced peaks in the excretion of estrogenic substances
- 3 A heavy decrease in the estrogenic excretion during menstruation
- 4 A variance between 20 IU and 400 IU of estrone in the estrogenic activity of the urine for two days. During the ovarian cycle, a healthy woman excretes on the average estrogenic substances with the same estrogenic activity as 1,100 IU of estrone.
- 5 In the great majority of cases (10 of 14), there is no decrease in the androgenic secretion during menstruation.
- 6 A distinct tendency to parallelism is seen between the excretions of androgenic and of estrogenic substances during the intermenstruum.

Similar conditions were found in the curves representing the excretions of estrogenic and of androgenic substances in the 10 women with myoma.

Finally, 2 castrated women were examined. No estrogenic substances could be shown in the urine up to two weeks after castration. Androgenic substances were present in the same amounts after and before the operation and in approximately the same amounts as in normal women.

Berutti, E. The Cause and Present Therapeutic Foundations of Human Sterility (Eziologia e basi terapeutiche attuali della sterilità umana). *Ginecologia*, Torino, 1940, 6 99

The principal points of the popular lecture on sterility given by Berutti are summarized in the following concepts which he offers for assimilation by the public and the medical profession.

1 Nowadays the study of the causes of sterility requires a series of investigations which reaches far beyond the study of the woman alone, and especially of the woman considered simply from the point of view of her organs of reproduction.

2 The causes of human sterility reside in the male more often than is generally believed, and the only manner in which this can be determined is by the clinical examination of the genital apparatus and the microscopic examination of the sexual secretion of the individual.

3 Although a normal size or a perfect harmony of the physical form is usually associated with a corresponding development of the genital organs, it is not exceptional to find that a general physical development even above the normal one may be accompanied by an absolutely deficient development of the organs which are more directly concerned with the reproduction of the species.

4 The volume of the uterus in itself is not always an indication of its degree of physiological development.

5 The arrested or retarded development of the female genital organs is not always caused by an infection with peritoneal localization, an infection of any other organ or system may bring about similar results and the infection itself need not necessarily be very severe.

6 Female sterility should be prevented and cured during the prepuberal and the puberal period.

7 There are anomalies and deficiencies of genital development which may simulate conditions of prenatal life or of infancy, but which may be due to conditions of sexual life subsequent to marriage, for example, immature genital development and regression because of voluntary avoidance of pregnancy.

8 There is danger of gonorrheal infection of the female genital organs at the time of birth when the fetus passes through the maternal vagina and, even more frequently, sterility due to gonorrheal processes may occur during the period extending between birth and puberty through rape, familial contact, and epidemics in institutions and schools.

9 With regard to the adults of both sexes, the gonorrheal infection does not necessarily have to be particularly virulent to produce grave and finally incurable consequences, in fact, often the infection has been rather slight and of short duration.

10 The gravity of the gonorrheal infection differs greatly in the two sexes: usually the capacity for fecundation remains intact in the male, while even very slight infections cause chronic inflammatory processes in the female with incurable functional results.

Women may be infected irretrievably without knowing it because they may not present any subjective symptoms of the disease and, when they come to the consultation disillusioned and tired of waiting in vain for pregnancy, the usual gynecological examination is incapable of discovering any objective alteration in the internal genital organs.

12. Because of tissue undernourishment and abnormal chemistry, insufficient development of the genital organs offers less resistance to infection in general and, in turn, infection contributes to the arrest and the deviation of the regular development of the genital organs.

13. There are many other minor causes of sterility. The presence or absence of libido has no importance for fecundation, but hypererectism might favor the appearance of spastic syndromes. It seems probable that sexual excesses present 4 times an obstacle to fecundation, either through progressive impairment of the functional activity of the male element, accompanied 4 times by periods of impotence due to a gradual decrease of the response of the nervous centers to the hormonal stimulation, or through the establishment of congestive and irritative processes in the female genital organs. Sterility may be due to hypovitaminosis, changes in the chemical reaction of the vagina, abnormal position

of the genital organs (such as uterine retroversion and hyperanteversion), tumor of the uterus, cyst of the ovary and anovular cycle.

The first step in the treatment of sterility must consist of recognizing and trying to eliminate any morbid changes present in the organism; this requires a thorough clinical examination from the anatomicopathological, functional, and psychic points of view. If general treatment is indicated, patients are absolutely necessary. If endocrine treatment, the principal object is the normalization of the testicular or of the ovarian function. Surgical intervention may be necessary to remove an obstruction of the seminal ducts in man or of the cervix in woman. Insufficiency of the tubes is followed by pregnancy in a certain percentage of cases. Surgery for female sterility must be strictly conservative. Artificial insemination must be considered with great reserve.

The statistics of the authors at the Center for the Study and Cure of Sterility (University of Turin) show 80 per cent of positive results in primary and 70 per cent in secondary sterility. 33.3 per cent of the positive results were obtained with hormone therapy given for from three to five months, 30 per cent with terosialography and 17.6 per cent with vaginal or uterine local treatment. Prophylaxis is paramount. RICHARD KENT, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Aldridge, A. H. Retrodisplacement of the Uterus in Relation to Pregnancy. *Am J Obst & Gynec*, 1940, 40 361

Retroversion and its associated conditions are not infrequently the cause of sterility, early abortion, and unpleasant symptoms following abortion and delivery. Unless it is known that retroversion preceded pregnancy, postabortal and post-partum retroversion should be treated by palliative means to reduce the incidence of permanent retrodisplacement of the uterus. Selection of cases for treatment by surgical means should be based on painstaking physical examinations and therapeutic tests to be sure that pre operative pelvic symptoms are gynecological in origin. Associated functional and pathological conditions of the uterine adnexa more frequently constitute indications for operation than retrodisplacement.

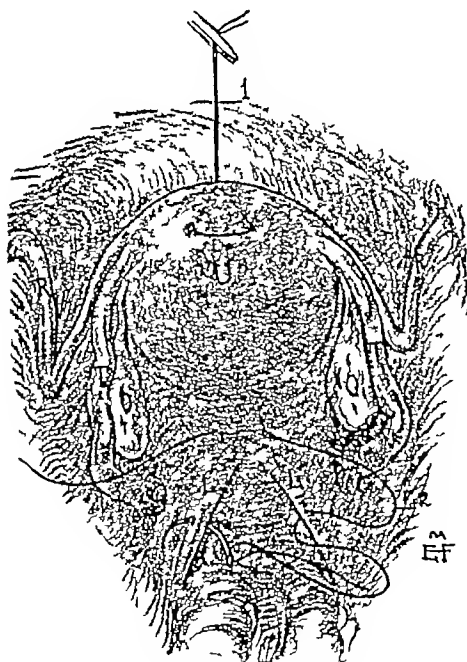


Fig 1 Shows the uterus, U, tubes, T, ovaries, O, round ligaments, R, and uterosacral ligaments, L. The uterus is being pulled forward by a chromic catgut No. 1 suture (1), which is used for traction during the operation and, finally, as a means of temporarily suspending the uterus to the anterior abdominal wall. Also a linen suture (2) is shown, which has been passed through the posterior surface of the uterus (U), and the uterosacral ligaments (L) in accordance with the technique recommended by Noble for shortening these ligaments.

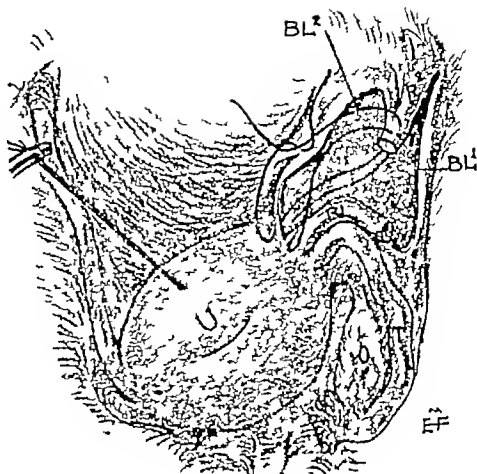


Fig 2 Shows the proximal end of the distal fragment of the round ligament (R²) being sutured with linen into the denuded angle at the junction between the uterus (U) and proximal fragment of the round ligament (R¹)

ment of the uterus. Operations for the cure of retroversion and its associated conditions should usually

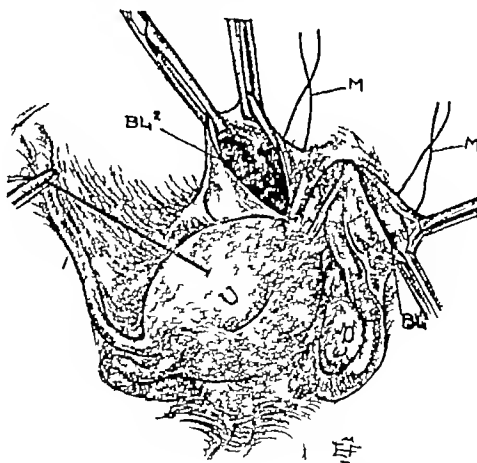


Fig 3 Shows the two portions of the round ligaments (R¹ and R²) united to each other with interrupted sutures of chromic catgut No. 1. After the round ligament (R¹ and R²) has been reconstructed it will be noted that both layers of the broad ligament are much relaxed, a fold of the lower layer of the broad ligament (BL²) being left near the uterus and a fold of the upper layer (BL¹) being left near the lateral wall of the pelvis. The relaxation in both these folds is taken up with mattress sutures (3) of chromic catgut No. 1.

be aimed at preserving the child bearing function and establishing anatomical and physiological conditions which will be favorable for subsequent pregnancies. Retroversion of the uterus is caused by relaxation of the broad as well as of the round ligaments, and operations for the cure of retrodisplacements of the uterus should be done by techniques which restore the function of the broad as well as of the round ligaments. The incidence of failure in operations of retroversion could probably be reduced if conception could be postponed until at least six months after operation. The Russell operation is described in detail.

In the discussion BAKER said he was in complete accord with much that the author had said. However, he was in complete and fundamental disagreement with him on the rôle of the round ligaments. He believed they play a rôle in the establishment and maintenance of ante displacement of the uterus.

HEANEY said the symptoms are not due to the retroversion ordinarily but to the accompanying pathology. The backaches associated with retroversion usually clear up when the accompanying erosion or endocervicitis has been cured. The dysmenorrhea of retroversion also clears up when the cervical pathology is cured. EDWARD L. CORRELL, M.D.

Albers, H. Pregnancy Toxemia, a Functional Problem (*Die Schwangerschaftstoxikose, ein funktionelles Problem*). *Monat. N. Krebsch.* 940, 513.

The dangers of hyperemesis gravidarum consist in acetonaemia and hypochloremia. As the chloride content of the blood diminishes, the residual nitrogen increases. If the hypochloremia is not recognized and treated, the patient will die of uremia. However, if chloride in the form of sodium-chloride solution is administered intravenously—rectally, the chloride content of the blood will be raised and the residual nitrogen diminished, with resulting recovery. Thus serious metabolic disturbances may be caused by purely neurofunctional disorder.

In early eclampsia one has to deal with pathological reaction of the body to pregnancy which involves the brain via the vascular system. The late toxemias are manifested by albuminuria, hypertension, and edema. The various forms may occur in combination. In spite of the low blood sugar during pregnancy the organism has tendency to increased glycogenolysis. In the toxemias of pregnancy the carbohydrate reserve is very low so that during labor the pregnant woman is forced to draw on fat and protein reserves for muscular activity. As pregnancy advances, the fat content of the blood is increased; this increase corresponds to the increased carbohydrate demand—the greater the carbohydrate deficit, the greater will be the hyperlipemia. The serum protein is diminished even in normal pregnancy and becomes markedly diminished in the pregnancy toxemias. The shifting of the albumin-globulin ratio may be considered a thinning process. The water-combining power of the serum is already

decreased in the normal pregnant woman and in pregnancy toxemia it is greatly decreased. The plasma volume is essentially increased with only slight increase in the total erythrocyte volume. The diminution of serum protein in the toxemias of pregnancy together with simultaneous concentration of the blood, indicates an absolute loss of serum protein. The closer the approximation of the protein content of the serum and the tissue fluid, the less fluid will flow from the tissues into the vessels, resulting in metabolic pre-stasis. The hydrostatic capacity of the tissues is increased by the abundance of sodium, and thus provides the prerequisites for edema.

The therapeutic conclusion to be drawn from these observations is that an attempt must be made to combat carbohydrate deficiency in pregnancy. The increase in pressure of the cerebrospinal fluid in pregnancy toxemia must be prevented and the flow of fluids from the vessels into the tissues must be prevented. To this end, the pregnant woman should receive a diet rich in carbohydrates, while proteins should be restricted so as not to exceed 70 to 100 gm. daily. In cases of severe pre-eclampsia, the fat intake should be limited to 50 gm. daily. The increased pressure of the cerebrospinal fluid may be relieved by repeated injections of 100 c.c.m. of 5 per cent glucose solution. The therapeutic effect, i.e., the increased water-binding power of the serum proteins, has not yet been fully explained. (Wienener) EDITH SCHAEFER-MORITZ.

PUERPERIUM AND ITS COMPLICATIONS

Rodríguez Ximeno, M. Visceral Tetanus in Pregnancy and the Puerperium (*Tetanus visceral en el estado grávido puerperal*). *Arch. ginecología y obstet.* 940, 544.

The author reports 3 cases of tetanus (postpartum and after unhygienic delivery). He reviews the literature and discusses the treatment and prophylaxis in detail.

The first case was that of thirty-four year-old multipara, born at the third month of pregnancy, attempted a self-induced abortion. There was considerable bleeding which the patient stopped with vaginal tampon which was left in the vagina for eight days. Twenty days after the attempted abortion, pains in the lower jaw developed and trismus appeared. The patient was treated with 1 c.c.m. of 5 per cent formal daily and as given a total of 350 c.c.m. of anti tetanic serum intramuscularly intravenously and subcutaneously. The patient recovered and went on to full term with live infant.

The second case was that of thirty-three year-old multipara who had been delivered twelve days previously of twins by an amateur midwife. She was admitted to the hospital in serious pre-eclampsia condition with trismus and rigidity of the neck. The patient died twelve hours after admission in spite of treatment with 5 per cent magnesium sulfate administered intramuscularly and 100 c.c.m. of ant.

tetanic serum One of the twins also died of tetanus, possibly through contamination of the umbilical cord.

In the third case a thirty year-old multipara had attempted an abortion after forty days of pregnancy Eleven days after inducing the abortion she was admitted to the hospital with trismus, rigidity of the neck, and exaggerated reflexes The patient received vaginal irrigations with Dakin's solution, luminal 5 per cent, magnesium sulfate, ether anesthesia, calcium chloride given intravenously, and a total of 1,590 c cm of anti tetanic serum given intramuscularly, intravenously, intraspinally, and subcutaneously Also 3 doses of anatoxin were given to stimulate active immunity The patient recovered

In reviewing the literature the author calls attention to Spiegel's report in 1915 of 65 cases with a mortality of 83.1 per cent The author notes that differential diagnosis must consider hysteria, trismus of local origin, meningitis, and strychnine poisoning

The treatment consists of local antiseptics of the wound or portal of entry, general sedative measures to control the muscular spasms, administration of large doses of anti tetanic serum for passive immunity, and, as the result of the work of Ramon, the use of anatoxin to promote active immunity By large doses of serum the author means 500 to 2,000 c cm of anti-tetanic serum

The author summarizes his report as follows

In 3 cases of visceral tetanus there was a mortality of 33.33 per cent The portal of entry in these cases was the uterus None of these patients had received prophylactic serum The cured patients had an incubation period of more than ten days Tetanus did not interfere with the progress of the pregnancy or the delivery of a normal infant The treatment consisted of sedative medication with luminal, chloral, or magnesium sulfate, which was injected intramuscularly, 10 per cent calcium chloride given intravenously, and ether anesthesia, large doses of anti tetanic serum were administered by all available routes and anatoxin was given for active immunity Visceral tetanus per uterus is due to faulty asepsis during labor or to contamination by sounds or forceps during attempted abortion

JACOB E. KLEIN, M D

NEWBORN

Fontana, G Normal and Hypertrophied Thymus in Newborn Infants (Il timo normale ed il timo ipertrofico nel neonato) *Folia demographica gynaecologica*, 1940, 37: 291

The author examined the thymus of 30 newborn infants, most of whom had died of accidents incident to delivery A table is given showing the weight and measurement of the thymus in the different cases and giving a brief résumé of the clinical history The histological pictures are reproduced

The average weight of the thymus in these cases was 12.5 gm, not much less than the weight of 12.6 gm given as normal by Hammar and Gaifami The lightest thymus weighed 6.7 gm and the heaviest 26 gm In 9 cases the weight was more than 13 gm The average length of the organs was 5.3 cm, breadth 3.9, and thickness 1.8 In the cases in which the thymus was hypertrophied the length was almost normal, the increase was in breadth and thickness Hypertrophy of the thymus was found in 7 males and in only 2 females Generally, an increased weight of the thymus was found in infants with a higher than normal body weight, but not always One fetus which weighed 3,630 gm had a thymus that weighed 6.7 gm, while one that weighed 2,400 gm was found to have a thymus that weighed 26 gm

The increased weight of the thymus was not caused by fatty infiltration or degeneration, increased connective tissue, or congestion It was due in all cases to an increase in both the cortex and medulla of the gland, with the predominant increase in the cortex

The sex glands and the hypophysis as well as the thymus were examined in all of the cases There was a disturbed development of the follicles in females and rarefaction of the seminiferous tubules in males This would seem to be due to the fact that the cortex of the thymus has an inhibiting action on the development of the sex glands, analogous to that seen in status thymicus in children, or there may be a disturbed reciprocal relationship between the thymus and the sex glands It is hard to explain the great increase of chromophil cells in the hypophysis in cases of enlarged thymus

AUDREY G. MORFITT, M D

GENITO URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Lauber H J and Hartmann, G. The Treatment of Tumors of the Kidney and Its Results (Die Behandlung der Nierentumoren nach ihre Ergebnisse) *Arch. f. Klin. Chir.* 940, 93 306.

The experiences at the Marburg Clinic, as well as those reported in the literature, testify to the fact that the prognosis of tumors of the kidney is bad. During the period from 1928 to 1938, 11 cases of hypernephroma in adults and 6 cases of adenoma coma in children were observed. Fifteen of the adults and 5 of the children were nephrectomized. Of the 2 adults, 4 are still alive from eleven months p to three years and nine months after operation. Of the 6 children only 1 is still alive, two and one half months after operation, and is already suffering from recurrence. All of the other children died within few months. Of the adults 4 showed recognizable hemorrhages macroscopically and microscopically. Among the children blood was never found in the urine.

On the basis of 21 roentgenographic pyelographies, the characteristic symptoms are discussed: they are filling defects of the renal pelvis or renal pelvic system, compression and distortion of the renal pelvis, and displacement of the ureter. However filling defects are never seen in cases of renal tumors in children, but in their stead longitudinal growth and often compression of the renal pelvis is noted. This longitudinal growth, if unilateral, is strikingly characteristic of renal tumor. The fact that the tumors do not perforate the renal pelvis of children explains the absence of hematuria.

(Dietrich Bloch) *Loth. Newwelt* 31 D

Kretschmer H. L. Adenomyosarcoma of the Kidney (Wilms Tumor); Report of 3 Cases. *Arch. Surg.* 940, 41 379.

Adenomyosarcoma of the kidney has certain characteristics which ordinary renal tumors do not possess and may be enumerated as follows:

It is essentially disease of infancy and childhood.

As a rule it runs a silent rapid course.

The histological picture is unique and singularly characteristic.

The outcome is generally fatal.

A multiplicity of theories have been advanced from time to time regarding its pathogenesis.

The embryonal structure of these tumors is their most distinguishing feature with a variety of tissue of abortive renal elements. The types of cells and amount vary in different tumors. The tumors are usually myxomatous tissue composed of masses of polymorphous nucleated cells in which are imbedded gland or duct like figures resembling uriniferous tubules which may be sparse or abundant. These

embryonic tubules in a heterogeneous matrix are the most conspicuous features. In addition there are epithelial and connective-tissue elements. The connective-tissue elements consist of loose stroma, well-differentiated round cells, and striated and non-striated muscle fibers. Cartilage and bone cells may be present in some of these tumors, but they are rare.

A palpable tumor is the most common early symptom. The enlargement is always progressive and painless. Hematuria is rarely present. Anemia and loss of weight are late manifestations as are also the pressure symptoms, as nausea vomiting constipation, and shortness of breath.

The presence of an abdominal tumor which rapidly increased in size and is hard and nearly always painless should lead to a tentative diagnosis of Wilms tumor. The diagnosis should be based on the results of complete urological study in every case. The diagnosis is further strengthened by changes in the pyelogram that are compatible with tumors. Cystoscopic examination, catheterization, and occasional tests are carried out before removal of the tumor is undertaken. It is necessary to rule out retroperitoneal tumors as neuroblastoma, sarcoma and lipoma. At times it may be necessary to differentiate enlargements of the spleen, tumors of the ovary and cysts of the omentum.

Six types of treatment have been followed: (1) nephrectomy alone (2) the use of serum in conjunction with nephrectomy (3) roentgen therapy to reduce the size of the tumor and kill embryonal cells followed by nephrectomy (4) roentgen therapy followed by nephrectomy and by another course of roentgen treatment (5) nephrectomy followed by postoperative roentgen treatment in order to destroy any residual malignant embryonal cells and (6) roentgen treatment alone. *Joan A. Loe* M.D.

BLADDER, URETHRA, AND PENIS

Ockerblom, N F and Carlsson, H. E. Congenital Hour-Glass Bladder. *Surgery* 940, 3 665

Hour-glass bladder may be defined as a congenital anomaly in which the bladder is divided into smaller cavities by transverse constriction, without change in total volume and without change in the component parts of the bladder wall. The constriction may occur either above or below the ureteral orifices. Congenital hour-glass bladder must be distinguished from (1) diverticulum, (2) patent urachus, (3) vesica duplex or vesica bipartita, (4) absence of the prostate and seminal vesicles, and (5) constriction due to inflammatory conditions, or as result of an injury.

Etiology. The condition of congenital hour-glass bladder must have some reasonable embryological

basis for its occurrence. The theories which have been advanced are

1 Atavistic relationship or hour-glass bladder normally found in some animals

2 Persistence of the embryonic ureteric membrane

3 Unequal growth of the two bladder anlagen

Diagnosis The symptoms are quite variable. Early symptoms include urinary difficulty, dysuria, and enuresis. Thirty-three per cent of patients, however, have no symptoms until later life. Acute urinary retention, hematuria, and the symptoms of a superimposed cystitis are then the most common.

On cystoscopic examination, the bladder is found to be divided into two cavities, one above the other. The ureters may open into either cavity. The relative size of the cavities is variable, but the combined capacity is that of a normal bladder. When the cystoscope is passed into the upper cavity, normal trabeculations and vessel markings are seen.

Treatment The treatment should be directed toward enlarging the opening between the two cavities, so as to allow better drainage. Since the total capacity is normal, it seems plausible to follow some procedure concerned with the eradication of the fibrous ring, whether the ureters open into the upper or into the lower cavity. JOHN A. LOEF, M D

Winer, J. H. Contracture of the Bladder. Elastosis of the Bladder. *J Urol*, 1940, 44 485

The observation of an abnormal amount of elastic tissue in the bladder wall is unusual. The newly formed connective tissue in instances of chronic cystitis with contracture of the bladder may be rich in elastic fibers. However, a review of the literature on the subject revealed no report resembling the following severe case.

A white married woman, aged sixty-four, was hospitalized in a semistuporous condition. The only past history obtained was that she experienced three attacks of renal colic in the previous twenty years. For two days previous to hospitalization there was constant hematuria, dysuria, frequency, and incontinence.

On examination the patient was stuporous, emaciated, and dehydrated. The blood pressure was 150/68. There was a bulging tender mass on the right side of the abdomen and edema of the lower extremities. The essential laboratory findings were as follows:

The leucocytes numbered 39,600 with 74 per cent polymorphonuclears. The urine was grossly bloody. The blood urea nitrogen was 47 mgm per 100 cc. plain. X-ray examination of the abdomen was negative with the exception that a concretion was noted opposite the second lumbar vertebra. The condition rapidly grew worse and she died on the third day after admission.

The essential post-mortem findings were as follows:

The right kidney pelvis contained sanguinopurulent fluid and the left pelvis was full of a grayish white purulent fluid. The ureters were extremely

tortuous, dilated, and kinked. The bladder was small, measuring 6 cm in diameter. The mucosal surface was gray in some portions and red, congested, and ulcerated in others. The bladder wall contained a small diverticulum and also a small yellowish cyst.

Microscopic section through the bladder wall at the left ureteral orifice showed squamous-cell metaplasia. Sections of the bladder showed acute and chronic cystitis. The van Gieson elastic stain showed the atrophic muscle fibers surrounded by dense accumulations of fragmented elastic tissue.

JOHN A. LOEF, M D

Young, H. H. Operative Technique in the Treatment of Vesical Diverticula. *J Urol*, 1940, 44 458

As a result of the study of diverticula of the bladder it is essential to stress the frequency with which dangerous pressure may be exerted by the diverticulum upon one or both ureters.

It is suggested that diverticula be removed intravesically. When the ureter lies within the wall of the diverticulum, its orifice opening into the cavity, it has been found possible by a special plastic procedure in which the incision is carried down within the diverticular wall around the ureteral orifice to remove the diverticulum intravesically, and thus preserve the ureteral orifice and draw it up into the bladder when the wound is closed.

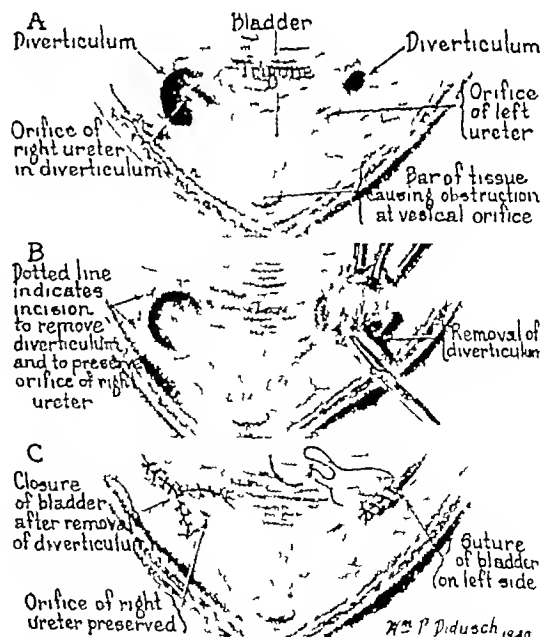


Fig. 1 The author's first case of diverticulectomy and technique employed in removal of 2 diverticula. Y plastic was first used in this case to preserve terminal portion of ureter

In certain cases it has been found possible to draw the diverticula sac into the bladder with large glass tube and powerful suction.

In the majority of cases, however an incision is made around the orifice of the diverticulum through the mucosa and submucosa, traction made with forceps, and enucleation carried out from within its fibrous sac. However when the diverticulum extends laterally it may sometimes be easier to carry the suprapubic incision through the lateral wall of the bladder down to the diverticular orifice. Through this enlarged wound the enucleation of the sac may be facilitated.

JOHN A. LLOYD, M.D.

Pearse, R., and McComb, R. A. The Treatment of Infiltrating Tumors of the Bladder. *Canadian Medical Association Journal* 1940, 43, 66.

The methods of treatment of infiltrating tumors of the bladder fall roughly into two groups. The first group, comprising x-ray therapy, radium, and diathermy aims at the destruction of the tumor in situ. The second group, comprising local excision, partial cystectomy and total cystectomy aims at removal of the diseased area intact. The ideal is destruction of the tumor without mutilation of the host, but this cannot be attained in the treatment of infiltrating tumors.

Cancer of the bladder may be treated by radical or palliative methods. Radical methods with the object of curing the patient should be advised when the disease is limited and the patient otherwise healthy. It is well known that there are cancer cells in apparently healthy tissue adjacent to the tumor.

In the decade from 1923 to 1933, partial excision of the bladder was performed in 26 cases of infiltrating tumor. Ten patients were lost sight of. Of the remainder 9 died within two months of the operation and 4 more died with local recurrence within the year. Mortality of 50 per cent within the first year. Four of the remainder died with local recurrence in from two to four years and 3 are under treatment for recurrent malignancy.

From 1933 to 1938 14 patients were subjected to partial cystectomy. Three died within two months and more before the first year elapsed. 4 more have since died of recurrence so that at the present time (1939) only 7 patients survive. The high percentage of local recurrence is clear proof that the area excised was too small.

Between 1933 and 1938, 4 cases were treated by suprapubic cystostomy and diathermy with or without radon implantation. Sixteen patients died during the first year. Certain mortality of 38 per cent. Eight patients were lost sight of in the same period, leaving 8 patients to be followed up. Five of these died of cancer and 3 of other causes without recurrence. The remaining 3 have been lost sight of.

From 1934 to 1938, 26 cases were treated with diathermy and radon through a cystostomy. Twelve patients died the first year. Two have since died of cancer and 4 have local recurrence. Five of the 26 are free from recurrence for from two to four years.

Ureterosigmoid anastomosis was performed in 13 cases with mortality of 50.5 per cent. The method used and the number of cases were as follows:

Method	Cases treated	Deaths
Colley II	3	
Huyghe	3	
Colley I	7	3

JOHN A. LLOYD, M.D.

GENITAL ORGANS

Schlappapetra, T. Spontaneous Hemorrhage of the Hypertrophied Prostate (Hemorragias espontáneas de la próstata hipertrofica). *Rev. argent. de med.* 1940, 9, 55.

The author first presents a classification of causes of hemorrhage in cases of hypertrophied prostate. He groups them as follows: (1) general conditions, such as (a) dyscrasias, hemorrhagic and those secondary to toxic conditions and renal, and (b) arterial lesions with or without hypertension; (2) local conditions, such as (a) the mechanical action of large adenomas with resultant stasis, varices, congestion, pseudotumors, trophic changes of the mucosa, and necrosis, and (b) local sepsis with congestion, suppuration, ulceration, or inflammatory proliferation; and (3) combined conditions which include both local and general factors.

The author emphasizes that the usual causes of hematuria may also occur in connection with prostatic condition, including the result of decompression of the urinary tract. However the author is concerned with severe acute hemorrhages in which endoscopy is frequently impossible. In such cases only cystostomy will expose the site and cause.

As concerns treatment, the author notes that in small hemorrhages simple rest, bladder drainage, and balneum are sufficient. In larger hemorrhages the clots may be aspirated and sodium citrate left in the bladder to prevent the formation of clots. In severe and dangerous bleeding exploratory cystostomy is done. Electrocoagulation is sometimes sufficient to stop the bleeding. The submucous resection of prostatic adenoma aids in stopping the bleeding and permits the completion of prostatectomy. Transurethral drainage through the middle lobe may mitigate hemorrhage which ceases usually on retraction of the mucosa.

The author briefly reports 6 clinical cases of prostatic conditions with hemorrhage. In most cases there was a local condition involving the mucosa. There are several photographs and 14 reproductions in the original article. Palliative treatments are advised until the patient general condition permits prostatectomy. JACOB E. KLEIN, M.D.

Seubert H. and Mencher W. H. The Viability of the Testis Following Complete Severance of the Spermatic Cord. *Surgery* 1940, 8, 672.

The procedure of complete severance of the spermatic cord as employed to achieve complete

hernioplastic closure in selected cases. Of a series of 25 cases in which unilateral severance of the cord was employed, 5 were followed up inadequately and 1 had an orchidectomy soon after operation, which left 19 for consideration.

In 6 cases (32 per cent) there was obvious atrophy of the testis, in 2 cases (10 per cent) there was slight atrophy, and in the remaining 11 cases (57 per cent) the testis, according to clinical observation, remained normal. There were, therefore, 13 cases (68 per cent) in which little or no atrophy occurred.

The microscopic findings of the testicle in 1 patient undergoing an orchidectomy thirty-one months after severance of the cord, showed a reduction in the number of the seminiferous tubules. All stages of spermatogenesis were observed although the sum total was reduced. The blood vessels were unchanged. The structures of the epididymis were not unusual.

As to the technique of the operation, each structure of the cord was tied off between the external and internal abdominal rings by separate suture.

JOHN A LOEF, M D

MISCELLANEOUS

Young, H. II. Operative Treatment of True Hermaphroditism, A New Technique for Curing Hypospadias. *Arch Surg*, 1940, 41: 557.

The author presents his second case of true hermaphroditism. The following characteristics were noted:

The breasts were typically male. There was a complete bifid scrotum and a penis of fair size, drawn back in the scrotal cleft by a chordee. The urinary meatus was present between the halves of the bifid scrotum. The right side of the scrotum contained a well developed, apparently normal testis and epididymis. On the left side was a large reducible scrotal inguinal hernia. No testicle could be felt. A cystoscope passed easily into the bladder which was normal. As the instrument was withdrawn an opening into which the cystoscope could be introduced was found. It was evident that this was a vagina, at the upper end of which a cervix and os were visible. In repairing the left inguinal hernia after freeing and opening the sac the author found and removed a small uterus, a fimbriated left tube and a gonad.

After the completion of the herniotomy, a plastic operation to straighten the penis was carried out, it consisted of the excision of the fibrous tissue down to and between the corpora cavernosa and the transplantation of the urethra backward into the perineum. The skin edges were then approximated. About twelve weeks later the right testicle was exposed. It was larger than normal, the surface mottled and irregular. The epididymis did not lie in the usual position, the globus major being attached to the testicle by a thin mass of tissue 7 mm long. Sufficient testicular tissue was removed for biopsy.

The next procedure was formation of a new urethra. An incision on the right side of about 3 mm

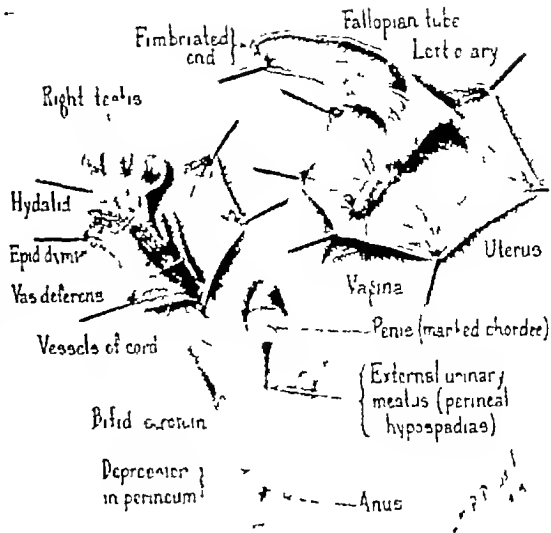


Fig 1. After opening the hernial sac on the left side, the uterus, tube, and ovary were discovered. At a second operation, several weeks later, the scrotum was opened on the left side, and the testicle and the abnormal epididymis were discovered.

and on the left of about 1.5 cm from the midline was made to include the glans. The cut edges were approximated and inverted. The skin was then approximated with a vertical mattress suture. Healing was per primam. The penis was normal length but most of the urine passed through the perineal urethrotomy.

Three months later the perineal mucocutaneous fistula was excised, a small catheter inserted, and the tissue drawn tight around it, with the hope that when it was removed the urethrotomy fistula would close. The operation was not entirely successful and a suprapubic cystostomy was done to drain the bladder. The perineal fistula was then excised and closed in layers.

The patient was discharged. The operative result was very satisfactory. The penis was straight, urine was voided freely and in a good stream. The patient reported that he had sexual intercourse frequently. Libido was normal and erections and ejaculation were normal.

JOHN A LOEF, M D

Greely, C. D., and Rea, C. E. The Treatment of Impotence with Male Sex Hormone. *Endocrinology*, 1940, 27: 392.

In a short report the authors review the etiological factors of impotence and summarize their article as follows:

The psychic type of impotence is the most common and difficult to treat. There is also the type due to organic disease of the nervous system, that due to local lesions of the genitalia, and that originating

from disturbances of function of the endocrine glands. Impotence on the basis of deficiency of a natural testicular hormone has been demonstrated to respond satisfactorily to testosterone.

The writers treated 3 patients complaining of impotence who had no evidence of hypogonadism over a period of three years. The patients ranged in age from twenty-seven to sixty years. Two had undescended testes 2 had had a posterior excision of the rectum for cancer 2 had chronic prostatitis while 6 had no demonstrable disorders. Eight were completely impotent 3 complained of inability to have intercourse more than occasionally and 1 had premature ejaculation. The treatment consisted of the intramuscular injection of from 1 to 25 mgm. of testosterone propionate three times a week for eight or more injections. While most of the patients felt less depressed mentally there was no improvement in the impotence. **REX W. RAWSON, M.D.**

Culp, O. S. The Treatment of Chancroid with Sulfanilamide. *Am J Syph Genet Br Ven Dis* 940, 46

A review of the literature on the use of sulfanilamide in chancroid, and an additional series of 55 cases is presented by the author. All of the patients were cured on an average daily dose of at least 60 gr. of the drug and no recurrences were noted. The

average time required to cure all patients in this series was thirteen days and the author concludes that sulfanilamide given orally is the most effective and convenient means of treating chancroids.

D. E. MITCHELL, M.D.

Granblatt, R. B. The Newer Venereal Diseases. Their Association and Confusion with Neoplastic Disease. *Am J Surg* 949, 404

The purpose of this article is to draw attention to the frequency with which genital malignancy is confused with venereal disease. The author cites cases of malignancy as a sequel to venereal disease, malignancies mistaken for venereal disease, and neoplasms of venereal origin. In his discussion of the topic and in the cases cited, he stresses the value of biopsy since the positive blood Wassermann reaction or the Frei tests in themselves may stand in the way of a true diagnosis of malignant process being made. Proper histological study may reveal treponema pallidum or the pathognomonic cell of granuloma inguinale, or it may suggest the diagnosis of chancroid disease or lymphogranuloma venereum. It is demonstrated by an analysis of the cases reported that positive Wassermann or a positive chancroid or Frei test does not necessarily reveal the lesion in question, and that biopsy may prove a successful undertaking. **JOHN A. LOREY, M.D.**

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Phemister, D B Changes in Bones and Joints Resulting from the Interruption of Circulation
General Considerations and Changes Resulting from Injuries *Arch Surg*, 1940, 41 436

Necrosis in bone resulting from aseptic interruption of the circulation is discussed together with repair of this necrosis. The first information of this process was obtained by a study of bone transplants, and then it was recognized that certain epiphyseal disturbances, such as Legg-Perthes disease, were really necrosing lesions. Certain fractures bordering on joints and dislocations may cut off the blood supply and cause necrosis of the ends of the bone. Pathological and roentgen studies of the reactions of the surrounding living bone to necrotic bone have been made. A zone of fibrous tissue forms about the necrotic focus of this fibrous zone becomes transformed into an advancing osteogenetic zone and as this advances the necrotic area is repaired, in some cases, particularly in the shafts of bones of adults and in the head and condyles of the femur, the necrotic area may be completely removed. Function to some extent aids this process, but if there is too much weight-bearing there may be a fracture of the weak new bone with possible collapse of the articular portion.

The nutrition of the cartilage may be interfered with and if the replacement of the underlying bone is delayed for longer than twelve months the cartilage is apt to die and a chronic deforming arthritis develop. There is enough of the living bone in one or two months to cause it to cast in the roentgenogram a shadow fainter than that cast by the dead bone which keeps its original density. The substitution by new bone then again alters the density so that these changes are well studied with the roentgen rays.

Traumatic interruption of the circulation of bone is most frequently caused by fracture. There is a small amount of necrosis of the fragment ends in almost every case of fracture, but it undergoes creeping substitution with the healing of the fracture. If the fracture is comminuted the broken-off pieces may undergo partial or complete necrosis, and creeping replacement is gradually accomplished, but if the fragment is too large the necrosis may be a factor in non union, and a case is cited in which an onlay graft was necessary to get union. There is often a good deal of aseptic necrosis to be observed on microscopic examination of the ends of the fragments resected at operation for ununited fracture.

Necrosis of the body of the astragalus following fracture of the neck is reported, and a fracture cast is reported in which resection of the astragalus was necessary because of failure of creeping substitution.

Fracture of the carpal navicular bone often results in severance of the blood supply and necrosis of the proximal fragment, if non-union results in the presence of necrosis there is usually much functional disability. The head of the radius and the lower articular surface of the humerus are often fractured with the head of the femur produced by intracapsular fracture is by far the most important lesion of this sort. In case of death of the head from injury to the circulation, the fracture may either unite or remain ununited. If the fracture unites, provided weight-bearing is avoided for many months, there may be subsequent creeping replacement by new bone to prevent the head associated with non-union has been studied at all stages. Where the head has in some portion undergone creeping substitution, insertion of bone grafts and wires for fixation is at times extremely satisfactory, and such a case is appended. Dislocation of the hip may result in interruption of the blood supply and necrosis of the head of the femur, and dislocation of the carpal lunatum is often responsible for its necrosis. A note of caution is sounded in that one must carefully consider the blood supply of the head of the femur and not excise the capsule of the neck while doing an arthroplasty of the hip joint.

HAWTHORNE C WALLACE, M D
Voznesensky, V P Discussion of Methods of Treatment of Acute Hematogenous Osteomyelitis *Sov Khir arkh*, 1940, 46 22

Observations on 414 cases of acute hematogenous osteomyelitis in children, combined with a study of the modern literature, lead the author to the following conclusions.

Cases of acute osteomyelitis may be divided into two groups. In the first, the process leads to the formation of one or a few circumscribed, isolated sequestra, the lesion presents itself in the form of a local necrosis of a relatively small portion of bone, with a marked reaction of the surrounding normal osseous tissue. In such cases an expectant treatment is fully justified and surgical procedures, if necessary, are limited to sequestrotomy. In the second group, a diffuse osteonecrosis involves the entire bone, without a circumscribed osseous demarcation, or nearly the entire bone at once forms a sequestrum. This group is smaller than the first. As to the treatment, radical procedures, without any compromise, are indicated. Expectant treatment in such cases is time-consuming and the dressings are painful, furthermore, the ultimate results are poor as the involved extremity is usually deformed, the patient becomes exhausted, and various complications, such as dislocation, may follow. The author advocates a secondary early subperiosteal resection of the involved portion of the

bone. The term "secondary" is applied to the operation because it follows primary incision of the subperiosteal abscess. The latter is an emergency operation, similar to tracheotomy in stenosis of the glottis. The secondary operation is performed as soon as the diagnosis of total sequestration of the bone or a diffuse osteonecrosis without localized sequestrum has been made. As a rule the resection can be planned three or four weeks after the primary incision because structural changes in the bones cannot be detected roentgenologically before that time. Furthermore one month after the primary incision the patient has usually recovered sufficiently from the acute attack of osteomyelitis.

A differentiation of both groups of osteomyelitis is not always easy and is based chiefly on roentgenological findings. The resection should be extensive in order to remove the entire affected area and to liberate the periosteum from the harmful effects of the pathological process.

The danger of formation of pseudarthrosis is more hypothetical than real.

The advantages of the method advocated by the author are particularly noticeable in regions where two bones are present, viz. forearm and lower leg. The time required for treatment is shortened, the danger of generalization of the process is minimized, and complications can be avoided in the majority of cases. The regenerated bone, as a rule, assumes its normal anatomical shape.

The average duration of treatment was from one to two months.
JOSEPH K. NATA, M.D.

H. Hultén, O. and Gellerstedt, N. Products of Wear and Tear in Joints. Their Resorption; Synovial Detritus (Ueber Abreissungsprodukte in Gelenken und ihre Resorption unter dem Einfluß einer Synovialdetritus). *Acta chirurg. Scand.*, 1930, 84.

It has been known for some decades that articular cavities rid themselves of certain particles of foreign substances and of clotted blood originating from intra-articular hemorrhage by moving them into quiet corners of the joint where they are slowly absorbed. It also has been known that there is constant wear and tear of the cartilaginous linings of the joints normally and to an increased extent after extreme use, hard work and in certain diseases. The products of this wear and tear are small particles of cartilaginous substance. This article is concerned with the fate of these products.

While Ferrieh and Hammar assume that such small bone and cartilage particles are dissolved by lysis, this was not the case in Hultén and Gellerstedt's experiments. The latter kept suspensions of minute cartilage particles in saline solution at body temperature for months and found only an occasional real liquefaction.

The authors obtained sterile suspensions of minute cartilaginous particles by scraping either rib cartilage or joint cartilage removed from experimental animals. These suspensions were injected into knee joints of either the donor animal or neither of the

same species or into different animal (rabbit and guinea-pig). Control injections of normal saline solution were also given simultaneously into the other knee joint.

The injected particles always moved either into the suprapatellar pouch or into the posterior pouch, which was analogous to the behavior of foreign substances in the bodies made by former investigators. These particles disappeared rather fast from the suprapatellar region and also from the posterior pouch. Smaller particles were incorporated into the synovial membrane by phagocytic cells, larger ones by synovial cells which grew around them. If larger conglomerates were incorporated in the synovial membrane the resulting lump, as too large to be leveled off by the synovial membrane, it could be torn loose by the movements of the joint and thus led to the formation of a loose body. The synovial membrane responded to the presence of minute pieces of cartilage not by the extravasation of leucocytes, but by hypertrophy and increase of the histiocytes. After cessation of the irritation the number of histiocytes decreased again but there remained increase of synovial connective tissue. After repeated administration of cartilage detritus, the picture of fibroplastic synovitis sometimes resulted, which the authors call synovitis chondrodetrítica. This is a common finding in all articular diseases with much cartilage disintegration, such as chondromalacia patellae, osteochondritis dissecans, arthritis deformans, and intra-articular fractures. Its subjective importance results from the fact that it produces pain. Rest reduces the formation of minute cartilaginous particles in a diseased joint, and even after a few days of rest the acute stage of cartilage digestion is over.

In certain conditions such as chondromalacia patellae, extension of the cartilage which is subject to increased disintegration, has been done with success. According to the authors, this result is due to eradication of the source of cartilage detritus. The authors suggest that analogous operations may occur after trauma, and in arthritis deformans, in which instances increased detritus formation may be assumed to be the cause of the articular symptoms.

HILDEBRAND LAURE, M.D.

Garrasano, F. H. A New Technique for the Transplantation of the Trapezoid Muscle in Isolated Paralysis of the Deltoid Muscle (Nueva técnica para el trasplante del músculo trapecio en la parálisis aislada del músculo deltoides). *Rev. de cirugía y traumatol.*, 1930, 4, 16.

The fixation of the shoulder joint for the treatment of simple deltoid paralysis means the sacrifice of very important joint and condenses very valuable muscles to atrophy. Therefore number of authors have proposed different means to overcome the deltoid insufficiency by demanding of other muscles the function of the absent one. Hildebrand and Baston Ansart employed the clavicular portion of the pectoral muscle. Lange united the trapezius

muscle to the deltoid "V" with a silk tendon, Spitzzy transplanted both the trapezius and the pectoralis muscles. Leo Mayer lengthened the trapezius muscle with a fascial flap.

The author has tried this last method, but he believes that it very often fails because

- 1 The fascial tendon must be implanted in the trapezius and in the humerus, which demands time and immobilization. Any movement under 90 degrees of abduction during the three or four weeks following the operation may produce failure. The passive elongation of the tendon through the simple action of the weight of the limb is also very important.

- 2 The acromial bridge is the most serious obstacle to the sliding of the fascial tendon because of the adhesions which occur in almost every case. In time the bridge becomes adherent to the tendon and the trapezius muscle reassumes its insertion in the acromion. In many cases which are considered successful only abduction of the scapula by the action of the trapezius muscle and not an active abduction of the shoulder joint has been effected.

The author's technique is as follows

- 1 The transformation of the acromion into a sesamoid insertion of the trapezius, fixed directly or indirectly on the humerus and thus preserving the natural attachments of this muscle.

- 2 The acromial sesamoid insertion is made by posterior resection of the spine of the scapula and anterior resection of the lateral quarter of the clavicle, outside of the thoracoclavicular ligament.

- 3 The trapezius can function freely and without the obstacle of any channels or bridges which may cause adhesions and a new insertion of the muscular transplant.

The operation must not be performed unless the muscles are strong and the movements of the joint are free. If the muscles are not strong enough, it is better to produce an arthrodesis.

The best incision is one which starts in the base of the spine of the scapula, curves around the acromion, and ends on the clavicle. The flaps must not be dissected extensively and the surgeon must try to lift a block of skin, subcutaneous tissue, and of the trapezius to overcome the tendency of the muscle to adhere to the scar tissue. The spine, the acromion, and the clavicle are freed and the deltoid is loosened from the bone subperiosteally. This must be done with the knife and never with the periosteal elevator. The same maneuver is made with the trapezius, from the base of the spine to the clavicle, but the portion inserted on the acromion is left attached.

With a thin bone chisel the acromion is cut at its base, the base of the spine is cut also. In this way the trapezius is freed of all its posterior insertions.

With the dissecting knife the surgeon cuts the coracoacromial and acromioclavicular ligaments. The acromion is raised and the trapezius is inverted, the latter is then dissected in its deep layer from the underlying tissue. The remaining part of the clavicle

is resected and now the trapezius is attached to the humerus. This is the most difficult part of the operation and as the force exerted by the arm between the abduction and the normal position is very important, the fixation must be done very carefully. A square recess is made with a thin chisel on the tuberosity of the humerus just lateral to the insertion of the supraspinatus tendon. The acromial transplant with the attached trapezius is applied in this recess and is fixed with a suture of chromic catgut. From this moment on the abduction must be carefully maintained. After the usual sutures a plaster-of-Paris cast is applied, with the arm in 90 degrees of abduction. After from twenty-five to thirty days of immobilization exercises are started.

The author has had gratifying results in 2 cases and hopes that his method will prove useful in the hands of other surgeons. HECTOR MARINO, M.D.

Ferguson, L. K., and Thompson, W. D. Internal Derangements of the Knee Joint. *Ann Surg*, 1940, 112: 454.

In this review of 100 cases of internal derangement of the knee, the authors point out the relative frequency of the various lesions which fall under this general diagnosis, detail the symptomatology upon which the diagnosis and operative indications

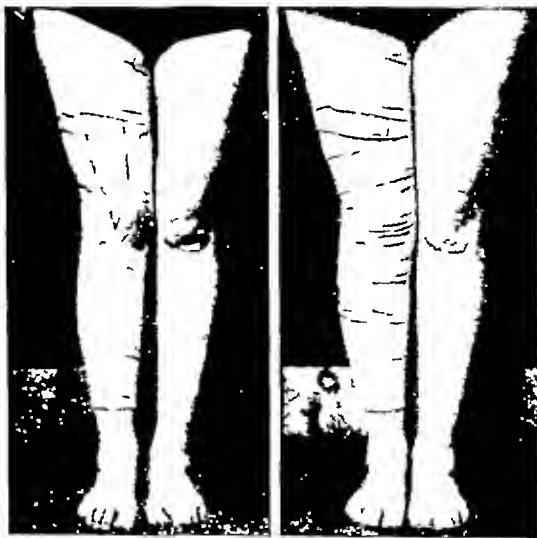


Fig 1

Fig 2

Fig 1. Adhesive strapping for the early treatment of internal injury to the knee joint. After aspiration of the effusion, a crisscross strapping is applied beginning well laterally and as high as possible on the thigh, extending downward across the lower leg at the knee. Several succeeding layers are applied using 2 in adhesive. The straps are anchored above and below by circular turns of elastoplast bandage.

Fig 2. Strapping the internal injury to the knee joint. The strapping is completed by the application of a firm elastic bandage at the knee.

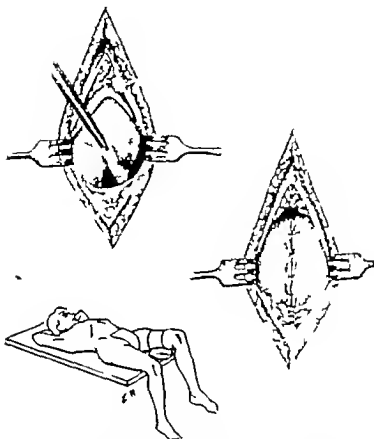


Fig. 3. Upper drawing: Case showing dog-eared tear of the anterior portion of the cartilage. In 7 patients only this torn portion of the cartilage was removed. Good results are obtained in all instances.

Middle drawing: Showing method of loosely suturing the capsule of the joint with interrupted sutures. The loose suture permits escape of joint effusion and so prevents secondary effusion of the knee after operation.

Lower drawing: Showing position of the patient on the table, sand bag under the knee, and towel under the thigh. It is to be noted in these drawings that the wound covers, which are clipped to the skin edges with Michel clips, have been omitted. (Courtesy of J. B. Lippincott Co.)

are based, and give the follow-up results obtained in 95 of the 100 cases. In addition, the operative technique and plan of after-care is described, as well as the operative complications which have appeared. Also, the anatomy of the knee joint is described, as well as the mechanism of the injury. This injury is usually caused by an indirect torsion of the femur on the tibia with the knee in partial flexion. Eighty-two per cent of the patients were males and in more than one-half of the cases the injury occurred as an accident of competitive sports.

Longitudinal tears (bucket handle) of the internal cartilage were the most frequent injury (5 per cent). Removal of the cartilage resulted in the normal

knee in 8 of 29 cases followed up. Tears of the anterior portion of the cartilage were found in 18 patients; there were 6 cases followed up; all of the patients have normal knee function.

The results are equally good with partial or complete excision of the cartilage. Tears of the midportion of the cartilage occurred in 11 patients. In 8 cases which were followed up the patients have normal knee function after excision of the cartilage.

has slight limitation of flexion, and has occasional catching and effusion. Posterior tears of the semilunar cartilage occurred in 6 patients; 5 have good function of the knee after removal of the torn cartilage. has poor result because of definite

relaxation of the ligaments of the knee. Abnormal looseness of the internal semilunar cartilage was found in 13 patients. In most of these cases there was also hypertrophy of the infrapatellar fat pad. Excision of the internal cartilage, with or without excision of the hypertrophied fat pad, was performed in 10 cases the knee function is normal. In 3 cases, in which the fat pad was not excised, there is a slight residual disability. Hypertrophy of the infrapatellar fat pad was found in 16 cases. In 10 of 15 cases followed up, the patients have normally functioning knees and 5 have occasional disability on twisting the knee. In two of the good results the fat pad was not excised. Injuries to the anterior cruciate ligament occurred in 4 cases. In only 1 of these was an attempt made to repair the ligament, good results were obtained in all cases. Osteochondritis dissecans or foreign bodies were found in 5 cases. 4 of these have good results, 1 patient has slight residual disability.

I except in a few patients, who came in with a knee locked in partial flexion, operation was advised as primary treatment. Aspiration of the knee and application of a dressing which permits fixation and function has been the practice of the authors, which was varied with the apparent severity of the injury. In the milder injuries fixation was obtained by crossed adhesive strapping, held at the knee by an elastic bandage. In the more severe cases a plaster of Paris splint was used in some instances, and, more recently, a castex case was applied from the ankle to the gluteal fold. If after a thorough trial of conservative therapy there were frequent recurrences of knee disability, operative intervention was indicated.

Cederlund, H. Two Cases of Intra-Articular Xanthoma of the Knee Joint (Zwei Falle von Intraartikularem Xanthom im Kniegelenk). *Acta Chirurg. Scand.*, 1940, 84: 143.

The first of the 2 cases of intra-articular xanthoma of the knee joint reported occurred in a girl aged thirteen, who had suffered no trauma to the knee. In August 1935 she began to complain of pain in the right knee after exertion and noticed swelling and tenderness. Occasionally she was unable to straighten the knee after bending and sometimes she felt round firm nodules on the lower border of the patella. When admitted to the hospital, a slight swelling of the joint and the nodules mentioned were found. The general examination and the roentgen ray studies were negative. At operation under local anesthesia Cederlund removed a mass, 0.5 by 4 by 1.7 cm which was attached to the synovial membrane by a small pedicle. It had filled a transverse space behind the patella on its lower border and after its removal both of the protuberances mentioned were gone. Histological examination of the mass showed xanthoma cells and led to the diagnosis of a xanthoma. There was no recurrence. The histological examination showed no recurrence. The histological examination showed no recurrence. The histological examination showed no recurrence.

The second case was that of a woman thirty-six years of age. At the age of thirty-two she had bumped her left knee slightly against a door. This was followed by swelling and slight pain which persisted for some months. After subsidence of the swelling she noticed a nodule on the medial and lower margin of the patella. This grew slowly, and there was increasing difficulty in flexing the knee-joint. There was an occasional locking of the joint in both flexion and extension.

Examination on admission was negative except for a slight fever and a moderate hydrops of the left knee joint. A nodule was felt as a firm movable body of bean size, medial to the apex of the patella. There was a slight tenderness of the medial articular cleft and marked pain on movement in the knee joint. Arthrotomy under local anesthesia revealed a marked increase of the synovial fluid and a tumor attached by a pedicle to the fossa intercondylar femoris. The pedicle was severed and the joint closed. Histologically a fibrosarcoma like tumor was found which contained a large amount of lipoid in foam like xanthoma cells which gave it a butter like appearance. The diagnosis of articular xanthoma was made. The recovery was uneventful. The blood contained 285 mgm of total cholesterol per 100 ccm and 74 mgm of free cholesterol.

The first case of xanthoma was reported erroneously as a sarcoma in 1865. Since then some 40 cases have been reported. They are about evenly distributed between the two sexes. The signs and symptoms are:

1. A palpable or visible tumor, usually hard and medial to the apex of the patella. Two or more tumors may mean multiple xanthomatosis, but not necessarily as the author's second case shows.
2. Pain.
3. Hydrops.
4. Functional disturbances as locking or impairment of flexion or extension.

Roentgen ray examination was negative in all reported cases of solitary xanthoma but in cases of diffuse xanthomatosis, bone atrophy and a reduction of cartilage were seen. Recently the increased blood cholesterol level (normal values from 160 to 250 mgm per 100 ccm) has been considered as a characteristic sign, but it is increased in only about half of the cases.

I except for 1 case of recurrent xanthoma, the diagnosis of xanthoma never has been made before the operation. The pre-operative diagnosis usually is a loose body, torn meniscus, lipoma, or osteochondroma.

The prognosis is good and there are no reports of metastases. Recurrences are rare and are supposed to originate from small tumors which had not been removed or operation.

The treatment is surgical removal of the tumor. Pathologically, the xanthoma of the knee is comparable to the xanthoma of the testis and the death of fatty acid ligament and also of the blood vessels. The histological examination showed no recurrence.

It is doubtful whether xanthomas are true neoplasms many authors believe them to be of inflammatory origin i granulomas, and they consider the coincidence of trauma and a disturbance of the cholesterol metabolism as essential for their formation. However both trauma and disturbance of the cholesterol metabolism have not been found constantly or even frequently enough to support such theory

HERRMANN LANGE, M D

Conway F M Rupture of the Quadriceps Tendon, with Report of 3 Cases. *Am J Surg* 1940, 50 3

Rupture of the quadriceps-extensor apparatus can occur by direct or indirect violence and may occur in the suprapatellar or infrapatellar region. McMaster's clinical conclusions, based on experimental animal studies, were that when a normal muscle tendon system is subjected to severe strain, the tendon does not rupture. However rupture may occur (1) at the insertion of the tendon to bone; (2) at the musculo-tendinous junction; (3) through the belly of the muscle; and (4) at the origin of the muscle from the bone. Either the muscle or the tendon may avulse a small fragment of bone, and sometimes the strain results in fracture or dislocation. Disease processes in tendons predispose to their "spontaneous rupture" often from only slight strain, as in tendons affected by (1) tuberculous tenosynovitis; (2) gonococcal tenosynovitis; and (3) trichinosis, typhoid, syphilis, or tumors. Rupture of muscle fibers occurs following both direct and indirect types of trauma. Degenerative changes and disease processes in muscles predispose to rupture. Slight or more extensive muscle ruptures occur following varying degrees of direct or indirect trauma and are often overlooked in clinical cases. Quilley indicates that almost all the traumatic ruptures of the quadriceps due to indirect violence occur as result of pure muscular contraction following such forced movements as are employed in the effort to avoid an impending or imminent fall. Ordinarily the muscular contraction is very violent and usually a misstep or attempt to regain one's balance is made following the effort to avoid a fall. This produces rupture of the extensor apparatus and the fall then occurs as result of the rupture. Rupture may occur also from a fall with the leg flexed on the thigh.

The pathognomonic physical sign of suprapatellar rupture of the quadriceps tendon is the presence of the fullness of the quadriceps pouch. This concavity or depression varies in depth with the extent of the rupture. It is only slightly marked if the anterior portion of the rectus femoris alone is torn. With an extensive laceration of the lateral expansions of the vasti muscles, one can visualize the superior aspect of the femoral condyles. The pathognomonic sign of complete infrapatellar ruptures is the shaft upward of the patella. Hemarthrosis of the knee joint indicates that the injury has involved the synovial lining of the joint cavity. In old cases in which the disability has existed for long time the symptoms and signs are again dependent upon the type of rup-

ture and the extent of the accompanying tissue damage. There is inability to extend the knee with consequent decrease in power to climb any incline and lack of stability in ordinary walking. This disability varies with the extent of muscle and tendon retraction and quadriceps atrophy.

Three operative cases are cited, 2 of which are suprapatellar ruptures and the third is an infrapatellar rupture. In all avulsion of the anterior tibial tubercle. The author reports that excellent results followed early operative repair.

F HAROLD DOWNES, M D

McElvanny R. T., and Thompson, F. R.: A Clinical Study of 100 Patients Subjected to Simple Exostectomy for the Relief of Bunion Pain. *J Bone & Joint Surg* 1940, 22:2.

Exostectomy relieves bunion pain by removing the projecting medial portion of the first metatarsal head. It does not correct the hallux valgus.

Under local or general anesthesia, a dorso-medial incision is started $\frac{1}{2}$ in. distal to the first metatarsophalangeal joint. This incision is carried proximally in a gentle curve it passes above the dorsal outline of the bursal sac and thence straight up the metatarsal shaft. The dorsal vein is preserved. The bursal sac is excised if it contains calcareous material, is nodular or is greatly thickened, but otherwise it is left intact. The capsule is incised in line with the skin incision. The joint space is located and the knife inserted between the medial side of the capsule and joint space. The knife is kept close to the metatarsal head while it separates the capsule from the bone for a sufficient distance to expose the entire medial side of the metatarsal head and small portion of the adjacent shaft. The amount of bone to be removed is determined from the gross appearance of the metatarsal head. The osteotome is placed on the metatarsal head parallel to the vertical axis of the metatarsal shaft and is pointed slightly medially. It is then driven through the bone which removes that portion of the metatarsal head that does not function as articular surface. The bone is inspected, sharp edges are rounded off and all loose pieces of bone are removed. The wound is closed in layers. The toe is bandaged to hold it in a varus position with slight plantar flexion. Active toe motion is encouraged. Sutures are removed on the tenth day and the patient is allowed up in comfortable shoes. Physical therapy is given in the form of foot and toe exercises, massage and contrast foot baths.

The 100 patients in the group operated upon were examined by the authors from nine months to six years after operations. Seventy-seven were entirely relieved of all bunion pain and discomfort. Eleven had vague aches and pains about the first metatarsophalangeal joint which suggested arthritis. No absolute cause for their discomfort could be determined. All 88 are considered to have satisfactory results because they are pleased with the operation and could recommend it to others.

The remaining 12 patients presented disappointing results. Eleven had both feet operated upon. Of 23 of these, 19 were painful. The cause of pain and disability following operation was due either to a faulty selection of cases or to some fault in operative procedure.

From the study, it is believed that a patient should fulfill the following requirements:

- 1 The patient should be interested primarily in the relief of bunion pain, not in correction of the deformity.

- 2 Circulation in feet must be adequate.

- 3 Sesamoiditis should not be present.

- 4 The great toe movement at the first metatarsophalangeal joint should be free and painless.

- 5 Hallux valgus should be under 50 degrees when estimated by the angle which the great toe subtends with the metatarsal shaft.

The operative faults encountered were:

- 1 Failure to remove loose bone spicules.

- 2 Inadequate removal of the medial portion of the metatarsal head which results in persistence of the bunion.

- 3 Too generous removal of the medial sides of the metatarsal head which allows pain because of shoe pressure on the prominence of the base of the first phalanx of the great toe.

- 4 Inadequate removal of the side of the metatarsal head which leaves a cortical ridge on the medio-plantar border of the head and persisting pain.

PAUL C. COLONNA, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Lapidus, P. W. Dorsal Bunion, Its Mechanics and Operative Correction. *J. Bone & Joint Surg.*, 1940, 22: 627.

The term "dorsal bunion" is suggested for a pathological condition of the big toe consisting of a plantar-flexion contracture at the metatarsophalangeal joint with a more or less pronounced dorsiflexion contracture of the first metatarsal at its articulation with the cuneiform bone. The deformity may occur in four types of cases:

- 1 Hallux rigidus.

- 2 Flaccid and spastic paralytic deformities.

- 3 Congenital club-foot.

- 4 Severe congenital talipes planovalgus.

The following surgical procedure has been devised by the author for correction of the "dorsal bunions":

The dorsal exostosis of the first metatarsal head is removed through a dorsomedial incision. In exposing the metatarsal head the dorsal capsule is turned up as a tongue-shaped flap with its base attached to the phalanx. Through another incision on the dorsomedial aspect of the foot, the first cuneiform metatarsal joint is exposed. In cases in which overactivity of the tibialis anterior is a factor in the production of dorsiflexion deformity of the first metatarsal, this tendon is transferred backward into the insertion of the tibialis posterior. The

fixed dorsiflexion contracture of the first metatarsal is overcome by a wedge-shaped resection with plantar base performed through the first cuneiform-metatarsal joint. If necessary, a similar resection is also done through the first cuneiform-navicular joint.

The action of the flexor pollicis longus tendon is then changed from that of a toe flexor to one of flexion of the first metatarsal. This is accomplished by detaching this tendon at its insertion and transplanting it through an oblique tunnel drilled in the metatarsal. Plantar capsulotomy and tenotomy are performed under the metatarsophalangeal joint. In suturing the initial incision over the big-toe joint, the dorsal flap is transferred proximally on the first metatarsal to help maintain the basal phalanx in the extended position. Plaster immobilization is maintained about two months.

DANIEL H. LEVINTHAL, M.D.

Garceau, G. J. Anterior Tibial Tendon Transposition in Recurrent Congenital Club-Foot. *J. Bone & Joint Surg.*, 1940, 22: 932.

In the cases of club-foot reported, recurrence of the deformity occurred in spite of vigorous conservative treatment by manipulation, casts, club-foot braces, and 36 operations including arthrodesis (4), decancellation of the calcaneum (3), Hoke operation (1), Ober operation (2), Brockman operation (3), osteotomy of the talus (1), Achilles tenotomy (16), fasciotomy (4), and capsulotomy (2). Forceful wrenchings, resulting in stiffening of the tarsal joints, had previously been done on at least half of the patients.

On examination it was found that when active dorsiflexion of the foot was attempted the foot was supinated. The anterior tibial tendon, inserted at the first cuneiform bone and base of the first metatarsal, pulled the whole foot into inversion, and exaggerated the inversion of the os calcis. This occurred with each step.

In every instance the strength of the peroneal muscles was not sufficient to evert or pronate the foot actively. In no patient had the inversion of the os calcis been completely corrected, and some degree of deformity in each component had recurred.

The average age of the patients was six and one-half years. Three were in their third year, and 2 in their sixteenth.

The operation consists of transferring the anterior tibial tendon insertion to the proximal end of the fifth metatarsal where it is anchored by passing it through a drill hole in the metatarsal and fixing it with a silk suture to the periosteum or to the soft plantar tissues. A circular plaster cast is applied, maintaining as much correction of the deformity as possible. Every two weeks the cast is removed and a fresh wedge-cast applied. Postoperative casts were worn for an average of eight weeks.

Transplantation of the anterior tibial tendon was performed on 56 feet in 44 patients. The influence of the operation of the adduction of the forefoot was

graded excellent in 9 feet, or 34 per cent good in 24 or 43 per cent, and not satisfactory in 3 or 5 per cent. The effect on the adduction was not noted in 1 foot, or 18 per cent.

The effect on the inversion was excellent in 30 feet, or 54 per cent good in 22 or 39 per cent and had no apparent effect in 4, or 7 per cent.

It was difficult to evaluate the effect of the operation alone on the equinus, because wedge casts were applied for an average of eight weeks after surgery. The final end-result was influenced remarkably by the degree of equinus present before the operation. Correction of the equinus is essential. In 3 instances, a tibial-turn operation was subsequently performed to correct the torsion of the tibia, with excellent results.

The indications for the operation are simple. If deformity recurs after vigorous conservative treatment, the mechanism of the anterior tibial tendon should be determined. If on active dorsiflexion, the foot is inverted and the forefoot is adducted, this operation should be contemplated. If the peroneal muscles cannot evert the foot, the operation is indicated.

F HANCOCK DOWNING, M.D.

FRACTURES AND DISLOCATIONS

Bértola, V. J. Recurrent Dislocation of the Shoulder: Coracoglenoid Osteoplastic Bridge. Operation of Ricardo Floaschietto (*Operación de Ricardo Floaschietto, puente osteoplástico coracoglenoideo* Operación de Ricardo Floaschietto.) *Rev. de med. y ciencias afines* 249, 345

Bértola uses the principle of Floaschietto's intervention to prevent the recurrence of dislocation of the shoulder. Coracoglenoid osteoplastic bridge is installed to retain the humeral head in the glenoid cavity. A costal graft, 7 cm. long is taken, usually from the fifth rib; one extremity is sharpened and perforated for the passage of a supporting suture and the other extremity is flattened to allow it to fit easily into the pocket cut in the external border of the scapula. If this variate of the intervention is used. The patient is then placed in dorsal decubitus

with the arm in slight abduction and external rotation and the forearm in supination; a combination of local and regional anesthesia is employed. The incision is made along the deltoid pectoral groove from the depression of Moenchheim to the junction of the lower border of the deltoid with the beginning of the external bicipital groove. The deltoid and large pectoral muscles are separated and retracted, with the cephalic vein resting on the deltoid. The coracobrachial and small pectoral muscles are separated and retracted, which exposes the subscapular muscle. The lower aspect of the horizontal portion and the anterior aspect of the vertical portion of the coracoid process are denuded by means of Floaschietto's curved elevator and two or three perforations are made through the midline of the coracoid process to facilitate its subsequent osteotomy (Kirschner wires are used for this purpose). The coracoid process is sectioned lengthwise with a chisel so as to obtain a V separation of $\frac{1}{2}$ cm. between its two halves. A pocket large enough to receive the lower extremity of the costal graft is made in the subscapular muscle, 1 cm. below the border of the glenoid cavity and close to the axillary border of the scapula (Fig. 1). The graft is passed from above through the V separation of the coracoid process and slipped down until it rests in the pocket of the subscapular muscle (Fig. 2). A No. 2 chromicized catgut suture introduced through the perforation previously made near the border of the upper extremity of the graft is passed round the coracoid process and, when tied, carries the graft inward and forces it down into the pocket of the subscapular muscle. If necessary, a suture is placed on the pocket, and the various planes are reconstructed separately. The arm is kept immobilized against the chest for forty days by means of plaster cast.

The author describes two variations of this intervention. In the first, after separating the deltoid and large pectoral muscles, he dissects the external border of the coracobrachial and retracts it laterally uncovering the tendon of the subscapular muscle, the upper and lower borders of which are dissected. If sections the muscle 1 cm. from its



Fig. 1

Fig. 2

Fig. 1. The broken line shows where the pocket is to be made in the subscapular muscle.

Fig. 2. Insertion of the graft into the pocket.



Fig. 3



Fig. 4

Fig. 3. Wedge-like incision in the axillary border of the scapula.

Fig. 4. Position of the graft.

insertion and examines the articular capsule to correct relaxations or diverticula if necessary. He retracts the subscapular muscle and exposes the axillary border of the scapula into which he makes a wedge like cut, 1 cm. below the capsular insertion and 1 cm. wide (Fig. 3), to receive the lower extremity of the graft which is otherwise implanted in the same manner as in the first operation. The subscapular muscle is then sutured to cover the graft, and the various planes are reconstructed.

In the second variation, the graft is given the same double osseous support, but the incision of the skin is made in a line from the coracoid process to the intersection of the mammillary line with the projection of the third rib, and the skin flaps are mobilized until the lower border of the clavicle and lower border of the large pectoral muscle and part of the deltoid muscle are exposed. In this case, the axillary border of the scapula is reached by separating the fibers of the subscapular muscle and the graft is installed through this opening (Fig. 4).

RICHARD KEMEL, M.D.

Murray, R. C. Fractures of the Head and Neck of the Radius. *Brit J Surg*, 1940, 28, 106

Fractures of the head and neck of the radius are the most common fractures involving the elbow. The author's article is based upon 459 cases studied between 1927 and 1937. The total number of fractures of the head or neck of the radius which were encountered over this period was 722. This number represents an incidence of 44 per cent of all elbow fractures and 4.5 per cent of all fractures treated at the Liverpool Royal Infirmary. In none of the cases investigated was the fracture compound. Fifteen per cent were complicated by the presence of other injuries to the elbow, forearm, and wrist. The majority of neck fractures occur in children and the older the patient, the greater the injury is likely to be.

The majority of the fractures of the head and neck of the radius result from indirect violence, the head being crushed against the capitellum. If this view is correct, the so called falls on the elbow are actually falls on the bent forearm resulting in forcible abduction and flexion at the elbow joint.

In the author's series of 459 cases, 401 (87 per cent) were treated conservatively and 58 (13 per cent) by operation.

Conservative treatment. In most cases all that is necessary is rest of the elbow in full flexion in a collar and cuff sling for from ten days to three weeks, according to the severity of the lesion. In complicated fractures full flexion may not be possible at once on account of swelling, but in the other types swelling is usually negligible. Flexion may also be limited by a displaced fragment, but such a fracture would rarely be treated conservatively. In simple cracks without displacement gentle active movements both of rotation and of flexion and extension are allowed from the start, the sling being discarded in from ten days to two weeks. In marginal fractures it is wiser not to allow any movement for ten days, and the same

is true for greenstick fractures of the neck. Communited fractures, depressed marginal fractures, adult fractures of the neck and most complicated fractures require three weeks' rest in full flexion before movements are started. In all cases active exercises of the hand, wrist, and shoulder are insisted on from the start. In some of the early cases of this series massage and passive movements were employed about the stage when the sling was discarded, but these were found to delay recovery and were abandoned as harmful. Manipulation was carried out in a few cases of displaced marginal fragments with relatively little success, but more often for fractures of the neck with angulation. In the latter group it is a most useful measure and it is probable that the majority of greenstick fractures of the neck with the usual backward and inward angulation could be reduced by manipulation if treated early. The important thing while carrying out the manipulation is to remember how the fracture was caused and forcibly to perform the opposite movements, viz., adduction and extension, with the thumb pressed firmly on the back of the head of the radius. This maneuver is facilitated in most cases by supination.

Operative treatment. For fractures of the neck with displacement, early manipulation should be carried out and open reduction undertaken only as a last resort. For a completely detached fragment displaced into the joint, removal of the fragment is necessary. For comminuted fractures, total excision of the head should be done, for depressed marginal fractures, either conservative treatment or total excision of the head is advised, but not removal of the depressed fragment only.

Results from conservative treatment. The simpler the injury the greater is the chance for recovery of full range of movement. The contrast between the displacement of marginal type with only 37 per cent recovery of full range of movement and the simple crack with 78 per cent recovery is very striking. Analysis of the cases with limitation of movement greater than 10 degrees shows that extension is the movement most frequently affected. Among 67 cases of all types, limitation of extension occurred in 92 per cent, of flexion in 31 per cent, and of pronation and supination each in 23 per cent. In the simple fractures without displacement extension was usually the only movement affected, while in the complicated fractures and fractures with displacement, movement was commonly limited in several directions. There is a very low percentage of cases with severe symptoms, compared with the relatively high percentage of cases with considerable limitation of movement in the cases treated conservatively and by operation.

Results from operative treatment. The author believes that the earlier the operation is done the better the result. Some of the poorest results were among the comminuted fractures treated by partial excision of the radial head. In such cases there is increased tendency to new bone formation around the head and neck.

graded excellent in 10 feet, or 34 per cent good in 24, or 43 per cent, and not satisfactory in 3 or 5 per cent. The effect on the adduction was not noted in 10 feet, or 15 per cent.

The effect on the inversion was excellent in 30 feet, or 54 per cent good in 2 or 39 per cent and had no apparent effect in 4, or 7 per cent.

It was difficult to evaluate the effect of the operation alone on the equinus, because wedge casts were applied for an average of eight weeks after surgery. The final end-result was influenced remarkably by the degree of equinus present before the operation. Correction of the equinus is essential. In 3 instances, a tibial-tna operation was subsequently performed to correct the tension of the tibia, with excellent results.

The indications for the operation are simple. If deformity recurs after vigorous conservative treatment, the mechanism of the anterior tibial tendon should be determined. If, on active dorsiflexion, the foot is inverted and the forefoot is adducted, this operation should be contemplated. If the peroneal muscles cannot evert the foot, the operation is indicated.

F HAROLD DOWNING, M.D.

FRACTURES AND DISLOCATIONS

Bértola, V. J. Recurrent Dislocation of the Shoulder. Coracoglenoid Osteoplastic Bridge. Operation of Ricardo Finocchio (Ligadura recidivante de hombro, puente osteoplástico coracoglenoideo. Operación de Ricardo Finocchio) *Rev de med. y cirugía (Sina)*, 1940, 345.

Bértola uses the principle of Finocchio's intervention to prevent the recurrence of dislocation of the shoulder: a coracoglenoid osteoplastic bridge is installed to retain the humeral head in the glenoid cavity. A costal graft, 7 cm. long, is taken, usually from the fifth rib; one extremity is sharpened and perforated for the passage of a supporting suture and the other extremity is flattened to allow it to fit easily into the pocket cut in the external border of the scapula, if this variation of the intervention is used. The patient is then placed in dorsal decubitus

with the arm in slight abduction and external rotation and the forearm in supination; a combination of local and regional anesthesia is employed. The incision is made along the deltoid pectoral groove from the depression of Moenbrim to the junction of the lower border of the deltoid with the beginning of the external bicipital groove. The deltoid and large pectoral muscles are separated and retracted, with the cephalic vein resting on the deltoid. The coracobrachial and small pectoral muscles are separated and retracted, which exposes the subscapular muscle. The lower aspect of the horizontal portion and the anterior aspect of the vertical portion of the coracoid process are denuded by means of Finocchio's curved elevator and two or three perforations are made through the midline of the coracoid process to facilitate its subsequent osteotomy (Kirschner wires are used for this purpose). The coracoid process is sectioned lengthwise with a chisel so as to obtain a V separation of 15 cm. between its two halves. A pocket large enough to receive the lower extremity of the costal graft is made in the subscapular muscle 1 cm. below the border of the glenoid cavity and close to the axillary border of the scapula (Fig. 1). The graft is passed from above through the V separation of the coracoid process and slipped down until it rests in the pocket of the subscapular muscle (Fig. 2). A No. 4 chromicized catgut suture introduced through the perforation previously made near the border of the upper extremity of the graft is passed round the coracoid process and, when tied, carries the graft inward and forces it down into the pocket of the subscapular muscle. If necessary, a suture is placed on the pocket, and the various planes are reconstructed separately. The arm is kept immobilized against the chest for forty days by means of plaster cast.

The author describes two variations of this intervention. In the first, after separating the deltoid and large pectoral muscles, he dissects the external border of the coracobrachial and retracts it laterally, uncovering the tendon of the subscapular muscle, the upper and lower borders of which are dissected. He sections the muscle 2 cm. from its



Fig. 1



Fig. 2



Fig. 3



Fig. 4

Fig. 1. The broken line shows where the pocket is to be made in the subscapular muscle.

Fig. 2. Insertion of the graft into the pocket.

Fig. 3. Wedge-like cut in the axillary border of the scapula.

Fig. 4. Position of the graft.

before the necessary force to dislocate the talus is developed, and in the aged the calcaneus collapses. Bilateral cases have been recorded twice in the literature. A history of a fall from a height onto the foot is usually given. Forty-four per cent of cases are compound, and in them the talus can often be seen in the wound. When the condition is not compound the skin is very tense over the displaced bone, and the appearance depends upon the position of the fracture, there may be circulatory changes or various stages of gangrene may be noted. Crepitus is usually absent.

The predisposition of the talus to dislocation arises from the facts that it is the only bone in the body without muscular attachment and that three fifths of its surface is articular. There is a weakness anteriorly and posteriorly corresponding to the plane of greatest freedom of movement, and it is in either of these directions that dislocation without fracture of the malleoli occurs. The talus forms part of three joints, the talocrural, talocalcaneal, and talonavicular. Dislocation is possible at any one joint alone or in combination and to this may be added a variety of fractures so that the number of possible combinations is great. A classification of dislocations and fracture dislocations of the talus is given and the mechanism of dislocation is discussed.

It is emphasized that there is a generous blood supply to the talus from all the vessels in the region and this is important in considering the chances of viability of the bone following dislocation. It is surprising how great the chance of survival is, even following complete dislocation. The close relationship of the dorsalis pedis artery makes it vulnerable to rupture or pressure in anterior dislocations. The fear of necrosis of the talus is quite ungrounded. In all but 1 of 13 of the 20 recently published cases, in which reduction of the dislocation was done and including 2 cases in which the talus was completely removed, washed in saline, and replaced, the results were satisfactory. In this 1 case reduction was done four days after the accident. These reports serve to emphasize the almost uniformly good results which have occurred after early reduction. Another important point is that when once the case has started to do well, it continues to progress satisfactorily and reports at intervals of years show the talus to be in good condition. It is emphasized that complete separation of the talus from all its attachments does not justify removal of the bone if the case is seen early. The results in cases in which the bone has remained dislocated for more than forty-eight hours before it was reduced are bad, and warrant early removal of the fragment or the whole bone. After forty-eight hours' displacement the bone undergoes degeneration. This is possibly a true avascular necrosis, the bone begins to lose its sharp outline and, later, fragmentation with complete destruction of the joints occurs. With an insufficient number of cases to decide upon, and in the present state of our knowledge, one would be tempted to try the return of the dislocated bone, particularly in the less complete lesions, in all cases

under a week's duration of unreduced dislocation. If it became apparent that the bone was degenerating, then recourse would be made to early talectomy, or partial talectomy, if the neck and head of the bone were viable.

The transitory increased bone density in dislocated and replaced tali may be due to some change in the interior of the bone, such as an increase of radio-impermeability due to the breakdown of fats in the cancellous tissue from poor blood supply. In other words, the avascular necrosis is in the cancellous bone spaces and not in the bone itself.

Reduction by the use of skeletal traction is a definite aid in that it gives a controlled extension of the space between the talus and the calcaneus. An open reduction may be necessary. Further observations are necessary to determine the maximum period of immobilization, but it is suggested that from one month to six weeks should be adequate and it appears advantageous to free the leg for exercises and merely avoid weight-bearing, after three weeks.

The author has presented in detail his case of an terolateral fracture dislocation of the talus which was reduced. Following the reduction there occurred a transitory increased density in the talus and only a minimum of limitation in motions of the ankle and subastragaloid joints remained. There was no subjective complaint or crepitation upon motion. Roentgenograms and diagrams are included.

The reviewer has had the experience of observing an anterior dislocation of the talus in a spastic extremity due to an extreme equinus position. Its existence was not known by the patient or his family. Satisfactory reduction was obtained by dorsiflexion of the foot to a right angle with the leg. There was an accompanying loud snapping sound.

ROBERT P. MONTGOMERY, M D

ORTHOPEDICS IN GENERAL

Mitchell, W R D. The End-Results and Treatment of Tuberculous Disease of the Ankle and Tarsus. *Brit J Surg*, 1940, 28 71

Tuberculosis of the ankle ranks fourth in the order of frequency with which the larger joints are affected. The author reviewed 169 cases and the progress of the condition in 77 children and 45 adults was followed for a minimum period of three years from cessation of treatment.

Patients under seventeen years of age at the commencement of the disease were classified as children. The reaction of the patient and the course of the disease depended on the age of the patient. In most children, if the disease was efficiently treated in the early stages, a good result with a usable foot could be anticipated, irrespective of tuberculous lesions elsewhere. New tuberculous joint infections often made their appearance even when the primary lesion was in the terminal stages of healing, but the added infection, while it reduced the general condition, fortunately did not seem to have any effect on the ankle joint, which proceeded to heal normally.

The majority of the cases of greenstick fracture of the radial neck were treated conservatively and it was only those with fairly marked deformity which were manipulated, and again only those which failed to respond to manipulation were subjected to open reduction. Although the greater number of those not manipulated had no appreciable deformity there were among them 9 cases with definite, though slight, deformity. When these were followed up, every one was found to have a full range of movement. There were also 9 cases with more marked deformity treated by manipulation, and of them 8 were found to have full range of movement when followed up. These figures contrast strongly with those in which it appears that only 1 of 7 patients who underwent open reduction obtained full range of movement. In the remaining 6 cases there was a very high degree of limitation, ranging from 5 to 90 degrees, confined in 5 of the 6 to radio-ulnar movement. Of the 6 patients with limited movement, 3 had limitation of pronation only and of supination only; the fifth had limitation of both pronation and supination, while the remaining patient had limitation in every direction. The last was the only one with roentgenological changes which offered an explanation, the remainder (with the possible exception of 1 not subjected to the roentgen rays) showed practically no roentgenological evidence that fracture had ever occurred in the neck of the radius. Bohrer has reported a series in children in which proliferative periostitis followed operation in a high percentage of cases. In the present series, this occurred only in the one case in which perfect reduction was not obtained; furthermore this was the only case in which any movement other than rotation was affected. This, therefore, is not the explanation for the limitation of rotation. The author believes that the explanation must be found in the formation of adhesions between the neck and the orbicular ligament divided at operation, and suggests that this might be one of the few conditions of the elbow which could be benefited by manipulation.

In this series removal of the head was never carried out in children, but among adults it was done in 3 patients, and there resulted only 3 cases of definite cubitus valgus amounting to an increase of 30 degrees and 1 case with slight lateral mobility. There were no cases with obvious secondary changes in the wrist, and the only other complication following operation was 1 case of myositis ossificans, following total excision for a comminuted fracture associated with dislocated elbow.

ROBERT F. MONTGOMERY, M.D.

Eastwood, W. J. and Jefferson, G. Discussion on Fractures and Dislocations of the Cervical Vertebrae. *Proc. Roy. Soc. Med. Lond.* 1940, 33, 65.

Clinically the cervical spine can be divided into two different areas, the first two vertebrae and the last five. The specialized function of the axis and this deserves separate consideration. There are 1 types of injury seen in the area of the axis and atlas

(1) injuries of the odontoid process and (2) dislocations of the atlanto-axial joint. Fracture of the odontoid may occur at its tip but is more common at the base. This lesion is often overlooked unless displacement is present. Hence careful roentgen-ray studies must be made to protect the patient from subsequent locking. Displacement forward of the axis may accompany the fracture and may cause sudden death. When the displacement is not so severe, the possibility of further displacement later must be kept in mind.

The author recommends recumbency from 1 to 6 weeks and then immobilization with a carefully made leather collar which extends all down the front and back of the thorax. Occasionally the axis will be displaced forward without fracture of the odontoid. This accident is usually fatal, but when not, is treated as described. Rotary dislocations of the atlanto-axial joint are possible but rare.

Injuries to the lower five vertebrae are either fractures or dislocations, or combinations of both. For simple fractures of the body the usual treatment is hyperextension. A neutral position is used for fractures of the neural arch without displacement. Most authorities favor a Minerva jacket. The author states that he has been impressed with the good results which have many times followed what seemed inadequate treatment and hence is inclined to condemn the Minerva jacket and use a molded collar. In bilateral dislocations the mortality is high. However, in unilateral dislocations serious spinal-cord symptoms are rare. Eastwood is inclined to favor immediate reduction under general anesthesia, while Jefferson is inclined to favor continuous traction especially as he believes that cord injury is most often produced by disc debris on the ventral surface. Continuous traction for some time corrects this. He advises skeletal traction with wire. After reduction, immobilization must be maintained for at least two months.

Fracture-dislocations cause the greatest percentage of cord symptoms and mortality. As a rule, complete dislocation of the articular processes does not occur and replacement may be secured by hyperextension. If, however, the displacement is complete, traction is essential. Recumbency for three months is necessary. Fortunately certain amount of deformity causes no pain if there are no nerve root or cord symptoms. Root injuries are the rule whether the cord is involved or not. Pain radiating down the shoulders and arms is often present. Loss of motor power is less grave sign than loss of sensation. Those patients do best who have primarily only partial sensory loss with some power of movement.

HAWTHORNE C. WALLACE, M.D.

Bountin, J. G. Dislocations and Fracture-Dislocations of the Talus. *Brit. J. Surg.* 1940, 33, 22.

A rare case of anterolateral fracture-dislocation of the talus is reported. There are 3 cases of fracture-dislocations reported in the literature. The incidence is highest in young adults. In children the key breaks

before the necessary force to dislocate the talus is developed, and in the aged the calcaneus collapses. Bilateral cases have been recorded twice in the literature. A history of a fall from a height onto the foot is usually given. Forty-four per cent of cases are compound, and in them the talus can often be seen in the wound. When the condition is not compound the skin is very tense over the displaced bone, and the appearance depends upon the position of the fracture, there may be circulatory changes or various stages of gangrene may be noted. Crepitus is usually absent.

The predisposition of the talus to dislocation arises from the facts that it is the only bone in the body without muscular attachment and that three-fifths of its surface is articular. There is a weakness anteriorly and posteriorly corresponding to the plane of greatest freedom of movement, and it is in either of these directions that dislocation without fracture of the malleoli occurs. The talus forms part of three joints, the talocrural, talocalcaneal, and talonavicular. Dislocation is possible at any one joint alone or in combination and to this may be added a variety of fractures so that the number of possible combinations is great. A classification of dislocations and fracture-dislocations of the talus is given and the mechanism of dislocation is discussed.

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ROBERT P. MONTGOMERY, M D

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Fracture-dislocations cause the greatest percentage of cord symptoms and mortality. As a rule, complete dislocation of the articular processes does not occur, and replacement may be secured by hyperextension. If however, the displacement is complete, traction is essential. Recumbency for three months is necessary. Fortunately certain amount of deformity causes no pain if there are no nerve root or cord symptoms. Root injuries are the rule whether the cord is involved or not. Pain radiating down the shoulders and arms is often present. Loss of motor power is less grave than loss of sensation. Those patients do best who have primarily only partial sensory loss with some power of movement.

H. WYCKOFF C. WALLACE, M.D.

Bonnie, J. G. Dislocations and Fracture-Dislocations of the Talus. *Bull. J. Surg.* 1940, 19, 88.

A rare case of anterolateral fracture-dislocation of the talus is reported. There are 5 cases of fracture-dislocations reported in the literature. The incidence is highest in young adults. In children the leg breaks

seventeen to thirty-five there should be six months' trial of conservative treatment by immobilization of the ankle in recumbency in an open air hospital. If the lesion then shows definite signs of healing, a further period may be prescribed under strict observation all the while. If at any time progress becomes arrested for more than three months, amputation should be performed immediately. In patients aged from thirty-five to forty-five years amputation should be considered if there is any doubt as to the patient's general condition. One should never wait for casts in the urine and other signs of general infection.

ROBERT P. MONTGOMERY, M.D.

Dubois, M. Amputations of the Lower Extremity
(Die Amputationen der unteren Extremitäten)
Helvet med acta, 1940, 6 781

In the supplying of an artificial limb to one who has had a leg amputated we must begin with the study of the amputation itself. Moreover, as unalterable conditions are brought about by the amputation it may be advisable to go backward a little and apply what has been learned from the building of prostheses to the contemplated surgical procedure. The surgical procedure must be carried out with full understanding of the difficulties and limitations encountered in the manufacture of an artificial limb. As the stump has only a very small functional use, the construction of an artificial limb must be considered independently of its possible function. The artificial limb should sustain the body weight and aid in locomotion, but it must simulate the normal limb in appearance. It should be movable without undue effort, but should give sufficient security in standing and walking. In addition, it must permit comfortable sitting. Security in standing and the possibility of locomotion must not without further consideration be combined haphazardly, the solution of the artificial limb problem will probably depend upon the individual preferences of the patient regarding the best compromise between security in standing and good locomotion.

The artificial limb is constructed according to the axis, length, weight-in-water, and angular relationships of the human body. The body is divided into two weight-bearing points. One begins at the center of the hip joint. This point lies a little to the side and a little in front of the edge of the great trochanter. First the sound limb is measured. The axis drops from the middle of the hip joint, over the middle of the knee-joint, and through the ankle joint to the inner edge of the foot. On the side it drops from the anterior edge of the great trochanter, in front of the knee-joint, but behind the ball of the foot.

From the amputated limb stump measurements are taken with weight, line, and rule to determine the different axes of the artificial limb projected into space. The contour of the stump is obtained by cutting out of stiff paper patterns at different levels and these patterns are then employed in the making of the limb. The stump on cross section has a tri-

angular shape. A cast of the stump is not necessary. The orthopedic mechanic employs a special apparatus with measuring scale with which the measurements for the reconstruction of the joints are strictly adhered to. There are also simple aids which permit the physician to control the construction of an artificial limb and the evaluation of it, and which in spite of individual peculiarities of the case enable the physician to see that the fundamentals are adhered to. The axis lines, however, offer only guides for the static function of the artificial limb. It is important to find that position of the limb which is most favorable for locomotion and yet does not interfere with the stability of the leg. For stability the axis line must extend from the central weight-bearing point to in front of the ankle-joint, and the ankle joint must be weighted against dorsal flexion. The axis of the knee-joint must be behind the line. The stability of the artificial limb increases the farther the axis of the knee-joint is placed posteriorly. By bending the femoral portion of the artificial limb posteriorly one can obtain the same result and at the same time avoid the uncomfortable overstretching of the stump. However, there should be no demands made upon the stump and only a limb constructed according to physiological laws and with consideration of the weight-bearing points will take care of even poor stumps.

In cases of exarticulation of the hip joint it is necessary to supply a pelvic socket with an artificial hip joint, which in a position of slight flexion is safeguarded against overextension. In amputations of the thigh the artificial limb has a slightly bent form, however, it must correspond mechanically to the axis relations previously emphasized. It must offer stability in weight-bearing. This is obtained principally by an ankle-joint which is properly braced against dorsal flexion. For stability the joint axes must be so placed and locked that the ankle-joint is behind the vertical axis line and the ball of the foot in front of it. The knee-joint must be braced against overextension. To facilitate walking one can move the knee axis a little forward. In the frontal plane the vertical line drops from the middle of the hip-joint through the middle of the knee joint and meets the ankle joint at the junction of the inner and middle third. The axis of the foot should be turned outward about 10 degrees (from 7 to 12). For practical purposes the axis of the knee-joint should be parallel to that of the foot. In the individual case it will be necessary to determine whether one wishes to favor stability or movement. The reserve power of the stump may be the deciding factor. A good stump is always an asset to the wearer of an artificial limb. It is of extreme importance to train the person who has an amputation to take short steps and to bring the hip weight-bearing point as far forward as possible until it becomes a fixed habit and he eventually does it automatically.

In leg amputations it must be remembered that the stump is never weight-bearing, the entire weight

must rest under the knee (tibial condyle and attachment of the patellar ligament) and on the thigh. The boot for the limb must be made so exact that all pumping is avoided. The knee joint lies little anterior and a little above the physiological axis of the knee-joint. The foot is brought little backward. The vertical line from the knee joint strikes the floor just behind the ball of the foot. For a Pirogoff stump a jointless rigid structure with shortened heel part is necessary. The heel portion should be so short that it rests just in front of the line coming from the center of the hip-joint. The foot in the equinus position must be pushed over laterally so that the frontal axis line falls upon the inner edge of the foot. The best material for an artificial limb is wood. The weight of an artificial limb for a thigh stump should not be more than from 2.5 to 3 kgm. Limbs of the lighter metals weigh less than 1 kgm. The fixation of the prosthesis is best accomplished by two shoulder straps or bandage. The proper construction of the artificial limb permits even relatively safe walking for a person with a bilateral amputation, and even without cane.

The chart of von Sauerbruch is of value to determine the site of amputation. The indications for operation should not be set lightly when one considers the difficulties in supplying an artificial limb but if it becomes necessary it should be done early.

This is true especially in mass destruction of the soft parts in which a peripheral ischemia or toxemia indicates early interference. The vital indication is most important in determining the site below which one must not go. Regarding the technique, a clean amputation should be done with the simplest method of covering the stump. Complicated methods add nothing. The formation of flaps is desirable and does not hinder the wide open treatment of the wound. The flap should not be too large and club-foot stumps are to be avoided.

A life-long amputation obligates the surgeon to provide the best functional means of locomotion for the retained life. The surgeon's duty does not cease with the amputation but with the procurement of the best artificial limb that the patient can use. As soon as the wound is healed the patient must be encouraged to move about, to move the limb, and to accustom himself to walking erect again. Temporary boots with splints may be used. As the stump regains its ultimate shape only after wearing the artificial limb or boot for some time, refitting of the boot if the limb becomes necessary. The so-called immediate prostheses are of no advantage. The patient should be provided with the artificial limb as soon as possible as it will take some time for him to educate himself in its proper use.

(Erlangen) Leo A. J. von Sauerbruch

nations were made within twenty-four hours and at the end of three, five, seven, ten, fourteen, and twenty-one days' preservation, for dehemoglobinization, fragility and preservation of the erythrocytes, preservation of the leucocytes with special reference to the neutrophils, preservation of the platelets and prothrombin, and the preservation of the heparin, fibrin, complement, and bactericidal activity.

From this study it is apparent to the authors that none of the four preservatives employed in this investigation affords adequate protection of the neutrophilic leucocytes and platelets. This phase of blood preservation has not received the attention it deserves in relation to the transfusion treatment of the acute and chronic infections as well as in relation to the hemorrhagic states due to prothrombin deficiency. For these reasons the author has advised against the use of blood preserved for more than three days for these therapeutic purposes as fresh blood appears advisable.

Possibly the same applies to the transfusion treatment of the anemias, although preserved blood appears adequate for the treatment of acute hemorrhage and surgical shock. For these purposes, the authors believe that the addition of dextrose or dextrin to the preservative is advisable, as both of these substances appear to preserve erythrocytes better than plain citrate or the preservative advocated by the Moscow Institute of Hematology.

The two carbohydrate preservatives gave better protection of the erythrocytes against dehemoglobinization, fragility, and disintegration than the plain citrate and Moscow Institute of Hematology preservatives.

Marked reduction of the total leucocytes occurred with all four preservatives within three days, especially because of the disintegration of the neutrophils, but the two carbohydrate preservatives gave somewhat better preservation than the two without carbohydrates. HENRIET F. TUCKERSON, M.D.

DeGowin, E. L., and Jordin, R. C. Studies on Preserved Human Blood. Reactions from Transfusion. *J Am Med Ass* 94 5 895

The authors report the type and frequency of reactions in 213 transfusions of preserved blood as compared with the same data on 193 transfusions of fresh blood. Five hundred cubic centimeters of blood preserved by adding 650 c.c.m. of 5 per cent dextrose in water and 100 c.c.m. of 3 per cent sodium-citrate solution were found to be more stable than blood preserved with sodium citrate alone. Storage was limited to ten days for the blood-citrate mixture and to thirty days for the blood-dextrose-citrate mixture. The blood was not warmed before administration, which was accomplished with gravity apparatus and through a 30-gauge needle.

Chills and fever occurred in 1 per cent of all the transfusions and were believed to be due to pyrogens contained in the apparatus. There was no relation between the frequency of chills and the duration of storage of the blood or the type of preservative used.

Urticaria and hemoglobinuria were noted somewhat less frequently and were also unrelated to the duration of storage.

Two deaths are reported, one due to a lacerable transfusion (Group A to Group O) and the other to circulatory embarrassment. No types of reactions were noted in transfusions of preserved blood which do not also occur in transfusions of fresh blood. THOMAS C. DORRANCE, M.D.

Crosbie, A., and Scarborough, H. Studies on Stored Blood; The Leucocytes in Stored Blood. *Edinburgh M J* 940 47 551.

In considering the indications for blood transfusion, in relation to the four main constituents of human blood, the authors note that the first and probably the most important indication is to increase the erythrocyte content of the recipient blood and so enhance its oxygen-carrying capacity. The second is to increase the circulating blood or fluid volume by transfusing fluid rich approximates as closely as possible normal human blood. The third is to increase the defense mechanism of the recipient. The fourth indication is to increase the coagulability of the recipient plasma. This study is directed toward the behavior of leucocytes in stored blood.

Blood was withdrawn from the majority of the subjects with a closed apparatus. In all cases the anticoagulant was 3.8 per cent sodium citrate, the final concentration of citrate being approximately 0.38 gm per 100 c.c.m. of blood. The blood as stored at from 1 to 5° C. Differential leucocyte counts were all made on cover-slip films stained by Leishman's method. The term "degenerate form" was used to signify a cell which has lost its characteristics.

Neither the determination of the total leucocyte count nor the examination of a stained blood film gave any information regarding the viability of the blood cells. It is, however, upon the maintenance of this property of the leucocytes that the value of transfusion of stored blood in infective conditions ultimately depends. Accordingly an attempt was made to examine the motility of the leucocytes after varying periods of storage. For this purpose fresh unclotted blood preparation suitably diluted with isotonic saline solution as examined upon microscope enclosed in warm chamber the temperature of which was maintained at approximately 35° C. It was found that at the end of the first twenty-four hours, 10 per cent of the total leucocytes were disintegrated, and at the end of the second twenty-four hours, 8 per cent were disintegrated. From the end of the fourth to the fifth day 50 per cent were disintegrated, whereas, at the end of the tenth day 74 per cent of the total leucocytes were destroyed.

When the number of viable polymorphs were calculated, it was evident that blood stored for twenty-four hours will contain about 75 per cent of the number originally present, and that only 5 per cent will be found to remain after five day storage. This is

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

obviously a strong argument in favor of the use of fresh blood for transfusion, the object of which is to increase the number of circulating leucocytes. These results do not exclude the possibility that the transfusion of degenerate and non viable leucocytes may serve to stimulate leucocyte production in the recipient.

HERBERT F. THURSTON, M.D.
Malawaring, B. R. S., Aslward, F. X., and Wilkin-
son, J. L. The Potassium and Phosphate Con-
tent of Plasma from Stored Blood, Experiments
on Amount of Hemolysis. Changes in Potas-
sium, Change in Plasma Inorganic Phosphate,
Use of Plasma in Transfusions, and Preserva-
tion of Plasma After Separation. *Lancet*, 1940,
230 385

The authors studied the hemolysis, potassium diffusion, and phosphate values in blood plasma taken after varying periods (immediate, after two to four days, after fourteen to sixteen days) from blood pre-
served in sodium-citrate solution, heparin, and sodium-citrate glucose solution.

The amount of hemolysis in these samples was found to be least when sodium-citrate glucose solu-

tion was used and most when heparin was used, which confirmed previously reported studies by these and other authors.

The diffusion of potassium from the cells was found to be rapid, relatively unaffected by the preservative used, and in agreement with the work of Scudder, DeGowin, and Downman.

The increase in the phosphate level in the plasma was slight compared to that noted in the potassium content, it was greatest in the heparin preserved samples and least in the sodium citrate glucose samples.

Since information is not complete on the effect of a high potassium content in infused blood plasma, the authors advise the avoidance of rapid administration of this fluid and early separation from the blood cells as the best means of minimizing this possible danger.

Aside from precipitates in the blood plasma and the milkiness in the plasma samples with a high fat content, no changes were noted in plasma stored over a period of several months.

THOMAS C. DOUGLASS, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Hart, D.: Sterilization of the Air in the Operating Room with Bactericidal Radiation; Results from November 1, 1938 to November 1, 1939 with Further Report as to Safety of Patients and Personnel. *Arch Surg* 74:4 334.

The author reports the results of wound healing in an extensive series of cases operated upon under a field of ultraviolet radiation. Of 23 16 operations, 2,000 were clean and were performed in a field of bactericidal radiation, and in these no patient died of an operative wound infection. The mortality rate, in this series, was less than 1 per cent and the infections reported were mild and in many instances questionable. Also, it has been shown that marked reduction in the average duration and degree of elevation of the postoperative temperature reaction occurs.

As regards safety of the patient, the author states that he has never seen any ill effects or had any complaint from the patient referable to the radiation. Criticisms of the intensity of radiation used which have been made by others have been based upon the erroneous assumption that the dose used 50.43 microwatts per sq. cm. on the wound, whereas actually it has been only from 2.5 to 30 microwatts. At the present time all units in use but one give an intensity of 5 microwatts per sq. cm. of the operative site.

The operating room personnel can be adequately protected by covering or shading. In addition to the usual cap and mask, glasses and a sun helmet should be worn. The eyes must be protected by glasses and a close-fitting eyeshade or hat. It is emphasized that every one using ultraviolet radiation should void unnecessary exposure, at least until the risk of often repeated exposures over a long period is known.

JOHN A. GRY, M.D.

Smith, P.: Early Rising after Abdominal and Pelvic Operations (*Le lever précoce en chirurgie abdomino-pelvienne*). *L. I. Rev. médicale Canada* 94:2, 69-92.

Smith reports that since 913 in 900 surgical cases in which abdominal or pelvic operations were done he has had patients get out of bed within a few days after operation. This represents approximately 85 per cent of the operations of this type done in this period. In this series of 900 cases there were 4 postoperative deaths, and these could not be attributed entirely to the patients getting up soon after operation. These deaths included only 1 case of embolus. In no case was there any serious breaking down of the operative wound. Number of patients got out of bed and walked about with small drain in the wound. In 5 hernias operated upon in this series,

there were only 3 recurrences. A considerable number of the patients have been re-examined from six months to 1 year following operation, and in all the operative scar was in good condition.

The time at which the patient is allowed to get up varies in different cases, but in all these cases it was within the first five days, often within the first twenty-four or thirty hours. When the patient first gets up he is allowed to sit on the edge of the bed for a time, and as soon as the circulatory equilibrium is established, he may either be seated in a chair with the aid of the nurse or take a few steps. The distance that he may walk is increased day by day. Patients may be somewhat apprehensive on first getting up, but they soon learn that it does them no harm, and enjoy it. In most abdominal and pelvic operations with modern aseptic precautions, if the patient is not in a state of shock, early rising is indicated. However it is not advisable in patients with cardiac disease, diabetes, anemia, or disease of the liver or kidney. Special care must be exercised with obese and elderly patients.

The method of early rising is possible only with modern surgical technique—the strictest asepsis, careful suture, for which the author favors buried sutures, and the use of the newer least toxic anesthetics. Recently the author has operated under infra-red and ultraviolet light, which he considers of definite advantage in reducing postoperative illness.

Getting the patient out of bed within a few days after operation has many definite advantages. It stimulates intestinal peristalsis which relieves gas pains and abdominal distention. It also stimulates bladder function and relieves urinary retention. The postoperative use of narcotics is much reduced. Most important of all, it maintains the circulation of the blood and lymph and prevents circulatory stasis, and is thus one of the best prophylactic measures against postoperative thrombosis and embolism. In the author's experience as well as in the experience of other surgeons using this method, the incidence of these complications has been definitely reduced. The period of convalescence and the stay in the hospital is shortened in some cases by 50 per cent, as compared to the usual period of hospitalization in operations of the same type. This is of definite advantage not only to the patient but also to the hospital.

ALEX. M. MYRNE.

Meakins, J. C.: Shock—Its Cause and Treatment. *Canadian M. Ass. J.* 74:2, 43-50.

Shock presenting a singular clinical picture may follow dissimilar pathological states. It has been designated surgical, traumatic, postoperative, and posthemorrhagic, but it may occur in severe infections, burns, severe anemias, pancreatitis, peritonitis, acute coronary and pulmonary artery lesions,

high intestinal obstruction, severe diarrhea, and other conditions. An increased permeability of the capillaries occurs, as well as a diffusion of plasma fluids into surrounding tissues. The fixed cells undergo alterations and the intracellular and extracellular equilibrium of the electrolytes as well as of the fluids is deranged. It is these changes that result in the circulatory disturbance characterized later by a drop in the blood pressure.

Variations in the severity of the symptoms depend on the individual and the degree of the insult responsible for the initiation of shock. The beginning and progression of "shock" is best detected by frequent and accurate estimations of the hemoglobin or with the hematocrit. A rising hemoglobin percentage or an increase of cells to the plasma ratio indicates hemoconcentration due to loss of plasma through the capillary walls. This is probably the earliest indication of shock. Hemorrhage blurs the picture but does not obliterate it. A fall in the blood pressure is a relatively late indication and should not be awaited to institute treatment. Saline infusions are of value in preventing shock because they dilute the toxins and promote diuresis to eliminate the toxins and products of tissue maceration. Blood transfusions in addition supply hemoglobin and blood proteins. After shock has developed, saline infusions are not of much value but blood transfusions are indicated in hemorrhage. The correction of abnormal capillary and cellular permeability and the effects of this permeability are indicated. Concentrated serum infusions help to restore the osmotic equilibrium of the blood which has been reduced through loss of colloids into the extravascular spaces. Potent adrenocortical extract specifically strikes at the root of the condition by correcting the abnormal capillary and cellular permeability.

MANUEL F. LICHTENSTEIN, M.D.

Best, C. H. and Solandt, D. J. Studies in Experimental Shock. *Canadian M. Ass. J.*, 1940, 43: 206.

The present work was undertaken with a view to evaluating certain methods of treating shock in experimental animals. Shock was produced by the use of histamine, hemorrhage, trauma, and a combination of trauma and hemorrhage. There was produced a decrease in the volume of circulating blood which resulted in a low blood pressure. Marked capillary atony resulted in ischemia of the arteriolar and capillary walls. This maintained the atony after the original cause had been removed. It appeared that there is a factor in the production of wound shock which acts on tissues which have not been directly affected by the mechanical injury. The loss of fluid at the site of injury is also an important factor in wound shock.

The methods of treatment must be aimed at halting the various etiological processes and correcting their results. Infusion of concentrated blood serum or plasma restores the blood volume and helps to withdraw fluids from the tissues into the vascular

system. Plasma and serum prepared in such a way as to be non-toxic are therapeutically identical and may be kept indefinitely without deterioration. The experimental results indicate that unless the blood pressure is very low, pituitrin rather than epinephrine is the better vasoconstrictor to use preceding the administration of concentrated serum. Usually the serum was given when the pressure was arising under the influence of the vasoconstrictor. In this way it was thought that leakage of the serum through the walls of the dilated blood vessels might be minimized. The fact that this procedure in many cases yielded a relatively prolonged rise in blood pressure such as was never seen under comparable conditions after the administration of either the concentrated serum or the vasoconstrictor alone lends support to this view.

It is questionable if one can obtain permanent recovery of the animals in which the blood pressure has sunk so low as to require the use of a vasoconstrictor. The results of all experimental work on shock are difficult to evaluate because no two animals react in exactly the same manner to either the shock producing procedure or the treatment. Shocked animals respond similarly when the condition is initiated by any one of the experimental methods employed. In traumatic shock the injection of a hypertonic fluid is more beneficial than an isotonic one of the same constituents.

The value of concentrated serum has been tested in human cases. Concentrated human serum was obtained by the Ethlum technique. Human plasma was concentrated by the lyophil technique. Type O concentrated serum can be given safely to any recipient. Further studies are being conducted with the other types.

MANUEL F. LICHTENSTEIN, M.D.

Flinn, R. Parenteral Replacement of Protein with the Amino-Acids of Hydrolyzed Casein. *Ann. Surg.*, 1940, 112: 594.

The author's observations are concerned with the injection of an enzymatic hydrolysate of casein containing all amino acids present in casein, including tryptophan, capable of maintaining nitrogen balance, and promoting normal growth in rats. The preparation has the power of provoking restoration of the serum albumin in experimentally produced acute hypoproteinemia.

The dry powder was made up as a 10 per cent solution which was heated to 60° C. and passed through a Seitz (EK) filter, amounts of 100 c.c.m. were poured into flasks containing 400 c.c.m. of sterile 10 per cent glucose and adequate electrolyte was added. The mixture was then injected intravenously during one hour. A maximum of 400 c.c.m. daily, containing 9.6 gm. of nitrogen and 1,600 calories, was injected intravenously in 35 human adults, as the sole source of alimentation, with the particular purpose of parenteral protein replacement. The period of treatment varied from one to twenty three days and averaged over ten days.

SURGICAL TECHNIQUE

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ALEX. M. MERRIS.

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MANUEL E. LICHTENSTEIN, M D

Elman, R. Parenteral Replacement of Protein with the Amino-Acids of Hydrolyzed Casein. *Ann Surg*, 1940, 112: 594

The author's observations are concerned with the injection of an enzymatic hydrolysate of casein containing all amino acids present in casein, including tryptophan, capable of maintaining nitrogen balance, and promoting normal growth in rats. The preparation has the power of provoking restoration of the serum albumin in experimentally produced acute hypoproteinemia.

The dry powder was made up as a 10 per cent solution which was heated to 90° C and passed through a Seitz (EK) filter, amounts of 100 c cm were poured into flasks containing 400 c cm of sterile 10 per cent glucose and adequate electrolyte was added. The mixture was then injected intravenously during one hour. A maximum of 400 c cm daily, containing 9.6 gm of nitrogen and 1,600 calories, was injected intravenously in 35 human adults, as the sole source of alimentation, with the particular purpose of parenteral protein replacement. The period of treatment varied from one to twenty-three days and averaged over ten days.

Reports are given of 8 representative cases of which 3 were normal controls, pre-operative, and 4 postoperative patients. Evidence of utilization was shown by the achievement of nitrogen balance, increases in the serum-protein concentration, and clinical improvement, particularly after serious operations. After serious operations many patients excreted large amounts of urinary nitrogen, indicative of toxic destruction of protein. Clinical improvement during treatment seemed to be associated with the partial or complete replacement of this nitrogen loss by the amino-acids administered.

Various difficulties, among which occasional reactions have been the most serious, are described and discussed. They are being rapidly solved by newer methods of preparation of the amino-acid mixture and of the solutions made from it.

WALTER H. NADLER, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Spadra, R. E. Immediate Repair of Flexor Tendons. *J Kansas M Soc* 940, 4: 370.

To obtain the best results after injuries to the hand, there are certain fundamental principles which should be followed. Knowledge of the anatomy and function of the individual nerves and tendons of the hand and forearm is the first consideration, since only with this is it possible to make an accurate determination of the damage done and the surgical procedures which will be required.

When the patient is first seen, a sterile dressing should be applied to the injury, bleeding is best controlled by the use of tourniquet. The extent of the injury is next determined by observation of function of the hand, and not by probing or exploration. An excellent review of the anatomy and loss of function resulting from division of various tendons is given.

The treatment to be administered is determined by the time which has elapsed since the injury occurred, account being taken of the character of the first aid that has been given. Tendons of the fingers and hand should not be repaired after six hours, and those of the wrist not after eight hours.

In the operating room a blood-pressure cuff inflated to a pressure of 50 mm. of mercury is the most satisfactory tourniquet. In the preparation for surgery the dressing with exception of that portion covering the wound, is removed. The surrounding skin is carefully washed with soap and water, and the wound is then gently irrigated with normal saline solution.

A general anesthetic is considered the most satisfactory there is possibility of further damage to already injured tissue by local infiltration.

The smallest instruments available should be used. The best grade of No. 0 or No. 1 silk suture material is most satisfactory and the technique emphasized by Halsted should be followed. The type of suture for suturing tendons is discussed. The

author advises a simple suture (based on experimental work) which simply catches a bit of tendon on each side and traverses the tendon. This suture may either follow within the tendon or along the sides.

Most lacerations of the fingers and hands run transversely and since it is not possible to find the tendon ends through such a wound, enlargement is necessary. Mid-lateral incisions are best in the fingers, but they should not be long enough to destroy the pulleys. Often it is better to make a second separate incision than to keep extending the primary laceration. The incisions should follow the lines of the normal flexion creases, for a cut down the middle of either the finger hand, or wrist tends to form flexion contractures. Often, by means of these secondary incisions, the tendon can be lifted out and mattress suture can be made in it. These sutures may then be threaded through the tendon sheath and canal with probe, and the tendon pulled through.

The author explains in detail the anatomy and value of the fibrous aponeurosis within the fingers. When the tendon is divided within this fibrous sheath, it is necessary to enlarge this laceration of the aponeurosis and leave small defect, provided this defect will not be extensive enough to destroy the pulley action.

The tendon ends can sometimes be found more easily by flexing the elbow wrist, and fingers milking the forearm is seldom successful. The least harmful way to find the ends is to enlarge the incision. After the tendon ends are found, they should be treated with great care. The sutures should be placed immediately so that further manipulation can be made by the use of the suture. After repair of the tendons, the wound is gently sponged in order that the operator may see that all bleeding is controlled this should be absolute. Digital nerves should be approximated as well as possible. The interosseous and lumbrical muscles should be sutured, and the skin edges closed.

Immobilization should be continued for three weeks. A splint or plaster is used for flexor tendons, and this should fix the elbow at right angle, the wrist at 75 degrees, and the fingers in slight flexion. Physiotherapy is started after three weeks of immobilization.

In general it may be said that good results will be obtained in 95 per cent of extensor-tendon injuries, in 90 per cent of flexor-pollicis-longus injuries, in 85 per cent of injuries of the flexors of the wrist, and in 65 per cent of injuries of the flexors of the palm and fingers.

HARVEY S. ALLEN, M.D.

Cohen, S. M. and Schnulberg, C. A. R. The Treatment of War Wounds of the Limbs: Experience in 264 Cases. *Lancet*, 1940, 39: 237.

The "plaster method" of wound treatment is described and evaluated by the authors, who have had a particularly advantageous opportunity to study 266 cases of severe wounds. Of the 84 cases

treated with "plaster," 54 were compound fractures the remainder being extensive soft-tissue injuries

Briefly, the wounds were routinely subjected to careful skin preparation all obviously tattered skin and fascia muscle were excised, loose-lying bone fragments were removed, and bleeding points were crushed. Radiating incisions were made into the skin for better exposure and into the fascia for relief of pressure. Foreign bodies, if readily accessible, were removed, otherwise left unmolested. Drainage was provided by dependent counter incision. No wound antisepsis was used and in the case of large defects, the wounds were left wide open and packed with petroleum jelly gauze. All fractures were set up in the skin-tight plaster except for the use of plaster wool which was placed directly over the wound to absorb serum, and wool padding which was placed over points of pressure. The rule always to immobilize the proximal joints on both sides of the wound was followed. The only traction employed, with but a single exception, was manual, it was used until the plaster set.

The authors stress the point that no cast windows should be used as they create wound edema and serve no useful function. Wound infection is detectable easily from the constitutional reaction as well as the occurrence of pain. No anaerobic infection occurred, even in the presence of the gas bacillus which was cultured from 4 cases. Interestingly enough, no anti gas serum was administered to any patient and yet no infections developed.

The extensive soft-tissue injuries were treated in similar fashion with excellent results. Even the more minor injuries were partially immobilized with elastoplast, and in cases of lower-limb involvement, the patient was confined to bed.

Every patient received routine chemotherapy, a total dosage of 19.5 gm of sulfanilamide in forty-eight hours.

The described therapy contributed to the excellent results, there were no deaths, only 1 leg amputation for traumatic severance of the popliteal artery, and practically all of the patients enjoyed a smooth convalescence within ten weeks.

STANLEY ROBBINS, M D

Brown, J J M, Dennison, W M, Ross, J A, and Divine, D. Experience at a Casualty Clearing Station, Operative Procedure, Wounds of the Chest and Abdomen, Wounds of the Head and Eyes, Burns, Anesthesia. *Lancet*, 1940, 239 443

A group of 4 military surgeons assigned to a casualty clearing station report their experiences in the treatment of 500 soldiers wounded in the Battle of Flanders. All of the patients were evacuated under fire and suffered, in addition, the hardship of immersion and exposure to the sea. The injured were coated with grime and sand, exhausted by lack of food, and shaken by many hours of continual bombardment.

All the wounded required treatment for shock. When not contraindicated, the patients were bene-

fited by large quantities of hot sweet tea. Blood available from a previously established bank for just such an emergency was of inestimable value. Morphine, fluids, and hastily improvised shock cradles were freely used. Tourniquets, consisting of a variety of objects, such as helmet straps and puttees, saved many lives although the limb distal to the application site was devitalized.

Immediately on arrival at the casualty station, the wounded were graded in the order of necessity for immediate or delayed operation. Those marked for immediate operation suffered from burns, sucking chest wounds, and head and abdominal injuries.

Also selected for immediate operation were those who showed signs of gas gangrene. In cases of massive gas gangrene of a limb, amputation was performed. Areas of local gas gangrene were treated by incision, hydrogen-peroxide irrigation, and packing with sulfapyridine powder. Anti-gas gangrene serum was given intramuscularly and sulfapyridine orally.

The treatment of compound fractures of the extremities and joints consisted of débridement, reduction in "position for regaining optimum function," packing with proflavine soaked gauze, and immobilization in plaster. The wound and the cast were undisturbed for several weeks. The follow-up of patients treated in this manner showed satisfactory results in the majority of cases.

The authors confirmed observations made in World War I namely, that high-velocity bullets were relatively sterile, bomb fragments and shell splinters caused severe infections, and small surface wounds often hid considerable damage in the subcutaneous tissues.

Short bullet tracks were completely excised. Extensive bullet tracks were thoroughly cleaned at the point of exit and entrance, and incised and drained down to the center of the track. Foreign bodies were removed only in cases in which they caused severe pain or pressure symptoms, and prolonged infection.

Amputation of the upper extremity was always avoided. Injuries of the hand were treated in the most conservative manner.

Fractures of the femur were treated by fixed extension in a Thomas splint and Spanish windlass fixation. The Whitman plaster cast was never applied. Skeletal traction was not used. The ankle method of counter extension with the Thomas splint was found to be more satisfactory than the clove hitch which often caused pressure necrosis. Amputation of the lower extremity was often necessary. The short-flap method of amputation, with a marked limitation in the use of suture material, was preferred to the guillotine amputation. Gunshot wounds of the spine were treated by immobilization in a simple dorsal plaster shell because a spinal plaster jacket was a time-consuming procedure.

Patients admitted with abdominal wounds were treated by early exploratory operation. Pelvic and buttock injuries often inhibited signs of peritonism but by thorough exploration of the wound track, operation was avoided.

Indications for immediate chest surgery were wounds such as compound fractures of the ribs, sucking chest wounds, foreign bodies interfering with respiration, thoraco-abdominal wounds, and massive hemothorax with clot formation or infection.

Most of the head injuries received no operative treatment because of the delay before arrival at the clearing station. They were transferred to neurological center.

Penetrating injuries of the eye were usually so extensive that enucleation was necessary. Corneal foreign bodies were removed if they were superficial. Deeply placed foreign bodies were not removed, as a rule, because no magnet was available. Conjunctivitis caused by the explosion of bombs responded best to saline irrigations. Burns involving the eyelids responded better to irrigation with saline solution than to coagulation.

All burn cases were of the severe type. With more than one half of the body surface involved and often complicated by gunshot wounds. These casualties were in severe shock on admission. They were treated with morphine and heat and received synthetic corticosterone (1 mgm. every four hours). All varieties of fluids were given by every available route. After shock treatment, anesthesia was given with gas oxygen, and the burned areas were cleansed and treated with 2 per cent gentian violet followed by 1 per cent tannic acid and 1 per cent silver nitrate. Coagulum was encouraged by the reapplication of 1 per cent gentian violet every four hours.

Patients in shock from trauma or hemorrhage rapidly reached the fourth plane of anesthesia after about four whiffs of pure nitrous oxide. Anesthesia could thereafter be maintained with high concentration of oxygen. In wounds of the oropharynx, preliminary tracheostomy and administration of anesthesia through the tracheostomy tube were recommended. In wounds of the chest, anesthesia was given by means of Maschell's intratracheal tube passed by the indirect method.

BENJAMIN G. P. SHATTUCK M.D.

Collier, F. A., and Valk, W. L. The Delayed Closure of Contaminated Wounds. *Ann Surg* 940, 50.

The authors have employed a method of delayed primary closure of grossly contaminated wounds in patients with no apparent infection in 20 cases, and with only a very minor infection in the remaining case. This group of cases consisted of operations upon the lower bowel, with gross contamination.

The method described is as follows:

The peritoneum is closed with double No. 000 plain catgut, and the fascia is closed with interrupted sutures of No. 3 stainless steel wire. Near-far figure-of-eight sutures of fine silk are placed through the skin, and a flavine pack is placed under the untied sutures. The pack is removed at the end of twenty-four hours, and the sutures are tied.

When the pack is removed, the wounds appear dry and slick. Microscopic sections of the wound

edges, at twenty-four hours, show an exudate which consists of fibrin, in the meshes of which are polymorphonuclear leucocytes, wandering cells, some necrotic tissue and many young fibroblasts. It is suggested that after coagulation of fibrin occurs, the resistance of the wound is greatly increased because of the accompanying sealing-off of the capillary and lymph spaces. Delayed closure of contaminated wounds carries the wound through this critical period. Cultures taken from wounds are positive at the end of the twenty-four hour period, so that packing the wounds apparently has no bactericidal effect. The peritoneum and fascia are undoubtedly contaminated likewise, but apparently these tissues have a higher degree of resistance to infection than the subcutaneous tissues. Infection in wounds of the abdominal wall frequently begins in the subcutaneous tissues and spreads to deeper layers from this plane.

An analysis from records of previous similar types of operations showed that about 50 per cent of the cases showed serious wound infections. Delayed closure as described is believed to be helpful in the prevention of such infections.

LESTER H. WOLFE M.D.

Ellkin, D. C. Wound Infection. *Ann Surg* 940, 360.

A five-year record of wound healing, from 1935 to 1939, was made at the Emory University Division of the Grady Hospital. Wounds are classified as clean, potentially infected, and infected. A careful record of suture materials as kept. Material from wounds which showed serious exudates and hematomas was cultured, and if organisms were recovered the wounds were classified as infected. The records were kept by residents, who presumably had more impartial attitude toward wounds than the surgeons themselves. With silk, infections occurred in 2.1 per cent of the cases, as compared to 9.4 per cent of the cases in which catgut was employed. In only one year did the incidence of infection with the use of silk approximate the incidence of infection occurring with the use of catgut; the author attributes this approximation to the high percentage of infections occurring in the patients of one particular operator.

The objection frequently raised to the use of silk is that this suture material may act as a nidus of infection. The author believes that this danger has been greatly overestimated. Occasionally a draining sinus will continue until the silk is extruded or removed, but more often healing occurs without removal of the sutures. In the five years tabulated, there were only two instances of prolonged drainage and both healed within six weeks.

With these data evident, there was more pronounced tendency toward the use of silk in potentially infected wounds. These wounds included compound fractures, wounds of the heart and chest, and gangrenous appendicitis. In comparing the results obtained with the results in similar wounds in which catgut was used, it was found that only 7.9

per cent of the wounds sutured with silk as against 21.4 per cent of the wounds which had been sutured with catgut became infected

LUTHER H. WOLFF, M.D.

Karnitschnigg, H. von. A Contribution on Serum Prophylaxis in Tetanus (Ein Beitrag zur Serumprophylaxe beim Tetanus) *Wien klin Wchnschr*, 1940, 1, 403

Huebner opposed the prophylaxis of tetanus. His arguments have already been contradicted by others. The author reports the results obtained during the last twelve years in the Emergency Station No. 1 of Vienna. There were 34,314 traumatic patients altogether, of whom 16,269 were given prophylactic injections. No tetanus developed in any of them. On the other hand, during this time, 29 patients were treated without injections, of whom 12 died. Only 1 of these cases belonged to the author's clinic. This patient did not receive an injection as there was only a thumb contusion with a subungual hematoma, without an open wound. It is difficult to understand how the infection occurred in this instance.

The author states emphatically that tetanus cannot be avoided by a total excision of the wound. In 1 case this was done, and in spite of the surgery tetanus occurred. In 9 other cases excision of the wound was impossible because of injuries of the large blood vessels and larger areas of excoriations. Considering this definite proof of the value of prophylactic inoculations, serum exanthems, even anaphylactic shocks, cannot be regarded as weighty contraindications to this therapy. In the author's clinic there was only 1 such result, and it was a very unique case.

A thirteen-year-old girl received a very small injection of tetanus serum (250 AIE) for a small lacerated contusion of the knee. After a very short time she was in heavy shock with cyanosis, trismus of the masseter muscles, severe dyspnea, cessation of the pulse, and involuntary defecation and urination. She received 5 cc of coramine intravenously, and improvement followed in ten minutes. The next day she was normal. This patient had received 4,000 units of horse serum five years previously for diphtheria. Experiments were then undertaken in the clinic to establish whether or not a difference existed between the serum exanthemas of the Viennese and of the Behring serums.

There were 154 injections of the Viennese serum made in men, of these, 15 (12 per cent) exhibited exanthematous reactions. There were 74 women who were injected with the Behring serum, only 1 of these had an exanthematous reaction. Of 13 patients with open fractures and gun shot injuries who received both tetanus antitoxin and gas bacillus serum, 6 (50 per cent) were afflicted with exanthema. The albumin content of the different sera was also estimated. The Viennese serum contained 1.051 mgm per cent total albumin, the Behring serum only .607 mgm per cent, and the gas bacillus serum 1.121 mgm per cent. The albumin content of the

serum, consequently, is partly responsible for the frequency of exanthemas.

(FRANZ) MATHIAS J. SEIFERT, M.D.

Key, J. A., Frankel, C. J., and Burford, T. H. The Local Use of Sulfanilamide in Various Tissues. *J Bone & Joint Surg*, 1940, 22, 952

The authors advocate the local implantation of sterilized sulfanilamide not only in contaminated wounds but also in clinically clean operative wounds where infection is especially feared or undesirable. They have placed sulfanilamide routinely in hip-joints opened for arthroplasties and in other wounds without untoward effect, but have not used the drug in clean knee-joints after operations on semilunar cartilages. Saturated solutions of sulfanilamide and 5 per cent solutions of neoprontosil have been injected into infected knee-joints.

Joints and other tissues investigated tolerated the drug very well. The primary healing of clean operative wounds was only slightly inhibited by the powder. In open infected wounds it may be used repeatedly and does not seriously interfere with their healing. Culture media containing an excess of sulfanilamide and inoculated with various concentrations of streptococci, staphylococci, and Welch's bacilli inhibited bacterial growth during the first forty-eight hours but only the streptococci were killed. To sterilize the drug, autoclaving the dry powder in a flask proved satisfactory for clinical purposes, growth of the few surviving bacteria was inhibited and the clearing mechanism of the patient took care of them without difficulty. If lumpy after sterilization the powder was crushed and spread thinly over the surface of the wound after hemostasis had been effected and just before the wound was sutured. When the wound was to be left open or partly open larger amounts of the powder were used.

The effect of sulfanilamide on healing was studied in experimental fractures in rabbits and in operative wounds in muscles, subcutaneous tissues, fasciae, and the joints of 12 dogs.

WALTER H. NADLER, M.D.

ANESTHESIA

Christiansen, G. W. A Technique for General Anesthesia in Surgery of the Mouth. *J Am Dent Ass*, 1940, 27, 1575

Modern surgical technique has been possible only because of anesthesia, and it is evident that improvements in surgery and in anesthesia have developed concurrently. The author recalls the unsatisfactory methods of nitrous-oxide anesthesia for mouth operations in days gone by and compares them with present day methods. He calls attention to the safety record of nitrous oxide in dental operations for ambulant patients.

For operations in the dental office preliminary examination and a later appointment for operation, with suitable premedication, is recommended.

The technique of administration of nitrous oxide is discussed, attention being called to the dangers of obstructed breathing, cyanosis, and anoxemia. The symptoms of various stages of anesthesia are described. The author concludes by saying: "Just as examination and diagnosis precede intelligent therapeutic endeavor they dictate the course of anesthesia. Nitrous oxide-oxygen anesthesia can be adapted to the patient's eccentricities, however varied, provided pre-operative investigation has been painstaking enough to reveal them."

CHARLES W. FREEMAN, D.D.S.

Rees, S.: A Study of Anesthesia in Thoracic Surgery. *Ann. S. and A.* 1910, 9, 15.

Anesthesia for thoracic surgery presents many problems not encountered in any other branch of surgery. The anesthetist must be on guard to deal with emergencies.

This report concerns the results obtained with various anesthetic agents used in 1,938 thoracic operations, the majority of which were performed on patients with pulmonary tuberculosis. These anesthetics were administered at Sea View Hospital, Staten Island, between 93 and 939. Of these 1,938 anesthetics, 1 were nitrous oxide-oxygen, 225 were avertin, 800 were evipal, 600 were cyclopropane and 100 were local and regional.

In using nitrous oxide it is still necessary to give high concentrations of the gas to produce the required relaxation. Because of this, sufficient oxygen is not available to the tissues and cyanosis is a prominent feature in 60 per cent of the cases. Other disadvantages are struggling during the induction period, marked increase in the pulse rate and deep, forceful respirations, which are a handicap to the surgeon operating. The advantages of nitrous oxide are that it is non-inflammable and non-irritating and recovery from the anesthetic is rapid.

Avertin (tribromethanol) is given in doses of from 60 to 80 mgm. per kilogram. It is easily administered and pleasant to the patient's taste, and the induction is smooth. Other advantages are the quiet respiration and the small percentage of post-operative vomiting. However the disadvantages outweigh the advantages. There is a marked fall in the blood pressure, the breathing becomes very shallow and cyanosis follows in a large percentage of patients. Postoperative depression is prolonged with shallow respiration, cyanosis, and depression of the cough reflex. This favors stagnation of bronchial secretion with consequent increase in pulmonary complications such as atelectasis, pneumonia, and spread of disease to the healthy portions of the lungs. For this reason I believe that the use of avertin is contraindicated in patients with pulmonary disease.

Evipal carries an individual susceptibility which is so variable that in some cases no supplement for anesthesia is needed while in others it is necessary to give additional doses of evipal or supplement this with gas. Anesthesia is produced by giving 1 gm. of

evipal dissolved in 1 c.cm. of water intravenously at the maximal rate of 1 second per c.cm. In from twenty to forty seconds the patient falls into a natural sleep. Injection is continued at the same rate until twice the hypnoic dose has been given. The patient is watched carefully for signs of respiratory embarrassment. Should this occur injections are stopped immediately and resuscitative measures are instituted. In 1 of a series of 800 cases apnea occurred. There is an increase in the pulse rate and an average drop in the systolic pressure of 35 mm. of mercury in some patients. Fewer patients were in shock postoperatively than with any other anesthetic agent used. Similarly fewer postoperative pulmonary complications occur. Evipal is contraindicated in patients with liver damage as well as in patients with long-standing toxemia or septicemia or amyloid disease.

Local and regional anesthesia is indicated in patients that are considered poor risks for general anesthesia. It is also used in those instances in which intratracheal intubation is indicated but in which it is inadvisable. This is true in patients with extensive tuberculous laryngitis in whom there is danger of trauma to the larynx from the introduction of the catheter. With this anesthetic, pain was complained of during the operation in 31 patients and in 8 of these it was necessary to supplement the anesthesia with inhalation anesthesia. Cyanosis during operation was present in 3 cases so that oxygen or carbon dioxide oxygen had to be administered. Five patients complained of nausea, 3 others vomited, and 3 had arrhythmia.

Cyclopropane is administered by the closed carbon dioxide technique. A slow induction with the soda-lime filter is used. The bag is filled with oxygen and the patient takes several breaths while the mask is being adjusted. Cyclopropane is then introduced at the rate of from 300 to 400 c.cm. per minute and the oxygen flow reduced to 400 c.cm. per minute, and

within four to six minutes the patient is anesthetized. The cyclopropane is entirely shut off and the anesthesia is maintained with constant flow of oxygen approximating as closely as possible the metabolic needs of the patient. If anesthesia becomes too light cyclopropane is added as needed. Cyclopropane is a satisfactory anesthetic for chest surgery. Induction is rapid and smooth. There is only slight excitement in a small percentage of cases. The quiet, shallow respiration during the anesthesia is a great advantage to the surgeon. A sudden increase of the pulse rate is danger sign. Arrhythmia as noted in 5 per cent of the cases. This lasted from few seconds to ten minutes. A rise in blood pressure occurs during anesthesia in many instances. The advantage of cyclopropane is the rapid awakening following removal of the mask.

Mortality was lowest with evipal and cyclopropane (6.6 per cent and 6.7 per cent). Following local and regional anesthesia the mortality was higher (9 per cent). This can be readily understood when we realize that those patients who receive

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local and regional anesthesia were the poorest post-operative risks. The best results have been obtained with cyclopropane and evipal. In the opinion of this writer, cyclopropane is to be preferred of the two.

J DANIEL WILLEMS, M D

Silvers, H I, and Leonard, I E, Jr. The Use of Neosynephrin Hydrochloride in Maintaining Blood Pressure During Spinal Anesthesia. *Am J Surg*, 1940, 50: 79.

This article gives the results in 50 cases of abdominal and perineal surgery, with a list of the operations in one table and four chart figures. Quotations are included from a number of articles in the literature on the subject.

The pre-operative medication is stated as well as the amount of neosynephrin and spinal anesthesia

used. In each case the blood pressure was maintained and usually the pulse became slower.

The conclusions are that neosynephrin hydrochloride is an effective aid in maintaining stability of the blood pressure during spinal anesthesia. A definite bradycardia generally occurs with its administration. Deleterious effects such as cyanosis, palpitation, anxiety, or nervousness are not manifest if neosynephrin was given in the proper doses. The margin of safety of neosynephrin is greater than that of epinephrine or ephedrine. It is not effective in cases in which there is a loss of blood volume or shock caused by toxic conditions such as peritonitis. Until its exact action on the heart has been proved it is best to use small doses or to use its use entirely in cases which present serious cardiovascular pathology.

CARL R. STEINKE

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Sassaman, M. L. The Roentgen Aspect of Non-Putrid Pulmonary Suppuration. *Am J Roent*
genol 949, 44 345

Non-putrid pulmonary suppuration is a severe form of bronchopneumonia in which necrosis of the pulmonary tissue takes place. The condition is given consideration under the following headings: (1) suppurative bronchopneumonia without abscess, (2) abscess formation, (3) multiple areas of pneumonitis with cavitation, (4) segmental abscess, (5) pulmonary abscess with preexisting pleural complications and (6) bronchial disease. Several cases are cited in detail and illustrated by roentgenograms as examples of some of the conditions described.

ANNE HARTCO, M.D.

Olds, J. W., and Kirklín, B. R. Primary Carcinoma of the Lung: A Roentgenological Study of 296 Proved Cases. *Am J Roentgenol*, 949, 44 357

The present study was undertaken to find out what may be learned from a review of the roentgenograms in a large series of cases (296) in which the diagnosis of primary carcinoma of the lung was established by histological examination of tissue obtained on bronchoscopy (146 cases) or at necropsy (3 cases) or in which microscopic verification of the clinical and roentgenological diagnosis was

based on demonstration of metastatic carcinoma in the lymph nodes of the supraclavicular, cervical, or axillary regions (27 cases). Three cases in which the diagnosis was confirmed by histological examination of a specimen from the lung obtained at operation are added.

In considering the roentgenological manifestation in these 296 proved cases of primary carcinoma of the lung it should be kept in mind that 75 per cent of the roentgenograms are simply the routine stereoscopic, postero-anterior projections exposed at full inspiration at a target-to-film distance of 5 ft. Lateral view of the thorax are available in only 36 cases, and the report of roentgenoscopic examination is available in only 6 cases.

The roentgenological changes which have been interpreted as telecystic, and those classified as unilateral infiltration in the hilus (with or without extension into the parenchyma) are observed with equal frequency and represent the most significant changes in about one-third of the roentgenograms. Within this group (36 cases) approximately one-third presented telecystic alone, one-third, hilar infiltration alone, and the remainder presented a combination of the two.

So-called massive atelectasis, with the classical signs of a homogeneous increase in density over an entire pulmonary field, shift of the mediastinal structures toward the affected side, elevation of the



Fig. Left, Primary carcinoma originating in left main bronchus with roentgenographic changes limited to an increased density in the left hilum. The patient, now aged fifty, had had pain in his chest and occasional hemoptysis for eight months. Bronchoscopic examination revealed an infiltration in the wall of the left main bronchus at its junction with the bronchus to the left upper lobe. There was no ulceration. On biopsy the tissue showed only inflammatory changes. Right, Repeat roentgenogram of the same patient six months later showing increased density of the shadow in the left hilum and partial atelectasis of the left lower lobe. The patient's previous symptoms had persisted and he had lost weight. An ulcerating lesion obstructing the left lower lobe bronchus was found on bronchoscopy and on biopsy the tumor proved to be squamous-cell carcinoma, Grade 3.



Fig 2 *left*, Primary carcinoma of right lower lobe bronchus showing complete atelectasis of the right lower lobe. There is moderate compensatory emphysema of the right middle and upper lobes, flattening of the diaphragm on the left, and slight deviation of the trachea to the right. The heart is not displaced. The patient was a woman, aged fifty five, who complained of a productive cough, weakness, and loss of weight. On bronchoscopy an ulcerating bleeding lesion, which proved to be a squamous-cell carcinoma, Grade 4, was found almost completely occluding the right lower lobe bronchus. *right*, Primary carcinoma of right main bronchus, producing massive atelectasis of the right lung. The patient, a man aged sixty five, had suffered for two to three years with cough, dyspnea, and intermittent fever and more recently had been raising large quantities of sputum. An obstructing lesion of the right main bronchus was found on bronchoscopy, but multiple biopsies of the tumor showed only inflammatory changes. The patient died less than two months after registration at the Clinic and at necropsy was found to have a pedunculated tumor high in the right main bronchus and almost complete atelectasis of the right lung. The tumor proved to be a mucoid adenocarcinoma, Grade 2.

diaphragm, and possibly some narrowing of the intercostal spaces on the involved side, was observed in 13 cases. Although the shadow of a tumor or the reactive process in its immediate vicinity is usually obscured by collapse of a portion of the lung, that which was interpreted as being a definite tumor was recognized in association with atelectasis in 13 instances in this series. In only 5 of the roentgenograms was a well defined tumor seen through the shadow of hilar infiltration.

In this series of 206 proved cases, evidence of fluid was observed in 33 cases, but of that group only 11 cases (about 0.5 per cent of the total) presented a picture of complete hydrothorax. Changes interpreted as bronchiectasis were noted in 15 cases and definite evidence of pulmonary abscess in 7 cases. A homogeneous dense shadow obscuring a considerable portion of the pulmonary field and characteristic of no one pathological entity was confusing in 15 cases. Lobular infiltration, more or less suggestive of pneumonia, was present in 8 cases, and bilateral mediastinal widening, not inconsistent with the changes of lymphoblastoma, was observed in 6 cases.

As incidental findings, evidence of metastasis to the opposite lung was noted in 2 cases, metastasis involving a rib in one case, and metastasis in the dorsal spine in another. Marked elevation of the diaphragm on one side, suggestive of paralysis, was observed in

9 cases, and in 1 instance the primary tumor of the lung was associated with eventration of the diaphragm on the same side.

The most nearly pathognomonic of the roentgenological changes is a unilateral increase in density in the hilus (Fig 1), which is associated with some degree of atelectasis (Fig 2), of scarcely less importance. One or both of these changes were observed in two thirds of the cases studied, and in retrospect, it is clear that their presence should suggest at once the possible existence of bronchial malignancy. Likewise, the presence of an ill defined or rounded shadow of increased density (Fig 3), away from the region of the hilus, should be considered indicative of malignancy until proved otherwise.

Not infrequently, the earliest roentgenological changes associated with bronchogenic carcinoma are those which may readily be confused with a benign inflammatory process. In a few such instances, the demonstration of displacement phenomena in the presence of abscess or bronchiectasis, the coexistence of atelectasis and hydrothorax, or the recognition of an elevated and immobile diaphragm on one side may suggest the presence of malignancy. More often however the diagnosis of carcinoma will be considered only if its possibility is kept in mind.

It was found that the roentgenologist was able to make a definite diagnosis of bronchogenic carcinoma



Fig. 3. Left, Primary carcinoma of left main bronchus, producing definite shadow of tumor in the left hilum and partial obscuration of the left lower lobe. The patient was a woman, aged forty-six, who had complained of cough, dyspnea, and hemoptysis of only four months' duration. Bronchoscopy revealed definite stenosis of the left main bronchus just below the bifurcation of the upper-lobe bronchus and specimen removed from the bronchial wall at that point showed adenocarcinoma, Grade 3. The patient died shortly after total left pneumonectomy. Examination of the operative specimen revealed tumor 5 cm in diameter in oblique, the left hilum and lower lobe of the left lung. Right, Lateral roentgenogram of thorax of the same patient.

or at least to suggest its presence in about 60 per cent of these 206 cases. In the remaining 40 per cent the condition in one-third was confounded with inflammatory lesions of the thorax. In one-third a merely descriptive report was made and in the remainder the lesion was variously diagnosed as lymphoblastoma, metastatic carcinoma, interlobar fluid, tuber culosis, aneurysm, or negative chest.

Santa, L. R. Basal Exudates of Subphrenic Origin.
Am J Roentgenol 1940, 44, 350

This article is intended to point out the conditions which may cause conflicting opinions as to whether basal lesions of the pleural cavity have their inception in the chest, or originate in subdiaphragmatic infection, and to emphasize procedures which are of value in their differential diagnosis. Mention is made of the fact that basal shadows in the lung field most frequently have their origin within the pleural cavity and the usual causes for them are listed. Correlation of the clinical symptoms with roentgenological findings, in most instances affords the determining factor in the differential diagnosis. In some instances such correlation may serve only to narrow the diagnosis down to a few possibilities, and extraordinary methods of examinations may be required for the ultimate differentiation. Every available maneuver should be resorted to before extraordinary procedures are instituted for diagnostic purposes. Examinations made in unusual positions may be of value, or roentgenoscopic observations of the movements of the diaphragm may aid in determining the nature of the condition. The presence of associated lesions, which the roentgen examina-

tion may disclose, frequently gives a clue as to the origin of the basal exudate.

Elevation of the dome of the diaphragm, and immobilization or restriction of excursion have been pointed out as diagnostic criteria for subdiaphragmatic sources of infection, but these are only corroborating signs which fall less there is associated pleural exudate. The injection of lipiodol into the subdiaphragmatic abscess cavity after the aspiration of pus, to determine the extent and location of the cavity has been successful in only a few recorded cases for the determination of the subphrenic extent of the infection. If the cavity of the subphrenic abscess contains gas from bacterial action or other cause, the diagnosis may be facilitated, but even in these cases the possibility of the abscess being in the pleural cavity above the diaphragm often cannot be determined. Everything hinges on the location of the diaphragm. Indeed this still remains the all important question.

In the author's experience the best procedure for answering this question is the production of an artificial pneumoperitoneum which will aid in the exploration of subphrenic spaces by roentgenological examination. It has used it many times without unusual consequences. Only small amount of air is needed, and this may be injected with very simple pneumoperitoneum apparatus, consisting of Folin aspirator pump, kimber puncture needle and suitable tubing and connectors. Examinations in suitable positions after the air injection can readily reveal whether the subdiaphragmatic space is clear or obliterated by inflammatory processes or adhesions.

Taylor, A. G. C. Supplementary X-Ray Treatment for Carcinoma of the Cervix Uteri in Relation to the Direction of the Spread of the Disease
Brit J Radiol, 1929, 1, 65.

Although there is little scope for improvement in the results of the treatment of carcinoma of the cervix uteri by radium treatment alone because of the geometric limitation inherent in this form of treatment, the author believes there is considerable promise of improvement by combining roentgen therapy with it. He contends that this is true especially if adequate doses be delivered to sterilize the disease, and that this can be done if the involved area only be irradiated. Usually such involvement is unilateral and includes Bartholin's glands on the pelvic wall in close relation to the lateral attachments of the broad ligaments. Radium doses, only, delivered to the various structures by techniques in common use are shown to be inadequate to eradicate the disease if it has extended to the lateral part of the parametrium or to the adjacent pelvic glands.

Extensive consideration is given to the lymphatics of the cervix, to the pathology of the disease as regards its spread, and to the structures found involved in it at operation and autopsy to explain the rationale of the technique he has developed. This technique is described in detail. Clinical observations made when it was used are recorded and illustrative cases are cited at length.

A careful study of the cases treated has convinced the author that it is nearly always possible to determine within a few days of the completion of radium treatment which direction is the main direction of spread or whether the spread is symmetrical and then to direct the supplemental roentgen treatment accordingly. He believes the radium treatment may be relied upon to deal with the local lesion and the less affected side, whereas the spread to the more affected side should be intensively cared for by additional x-ray therapy.

In the author's opinion irradiation with roentgen rays should, as a general rule, be subordinated to that with radium and should follow the latter. The following scheme of treatment based on these principles and on the belief in the necessity of irradiating the smallest possible block of tissue is practiced by the author, and is submitted in this thesis:

1. Preliminary x-ray treatment or x-ray treatment only
 - a. Very septic cases
 - b. Cases in which the arrangement of radium foci would be quite unsatisfactory
 - (1) Cases with very contracted vaginal vaults
 - (2) Cases of very large proliferative tumors
 - (3) Cases with both fornices markedly thickened with tumor tissue
 - c. Cases with vaginal involvement below the upper third
 - d. Some Stage IV cases

Radium treatment only

- a. Stage I or Stage II cases in which the radium treatment is correct and the tumor symmetrical
- b. Advanced Stage III cases
- c. Some Stage IV cases
- d. Radium and x-ray treatment of the cervix and middle half of the pelvis
 1. Stage I and Stage II cases which are symmetrical but in which radium treatment has not been satisfactory
- e. Radium and x-ray treatment to the whole pelvis
 1. Stage III cases (bilateral) in which the general condition is good
- f. Radium and unilateral x-ray treatment to the more affected side
 - a. Stage I, II and III in which radium treatment is satisfactory and in which it seems probable that the other side will be controlled by the radium treatment
- g. Radium and unilateral x-ray treatment extended to cover the uterus
 1. As in Group f except that the arrangement of the radium is not satisfactory

ABRAHAM HART, C. M.D.

Gydenfuss, J. J. The Healing Process in Uterine Carcinoma Following Irradiation according to the Stockholm Method (*Der Heilungsprozess bei Strahlenbehandlung des Gebärmutterkrebes nach der Stockholmer Methode*). *Acta Obst et Gynec Scand*, 1929, 20, 147.

The material studied by the author consisted of operative specimens of cervical carcinoma from patients who had received radium treatment pre-operatively and from biopsies and autopsy material taken from similar types of patients. This material enabled the author to observe in series, the effects of radium treatment in carcinoma of the uterus, from the first stage of treatment up to a period of three years after treatment had been instituted. The Stockholm method of radium treatment for cancer of the cervix consists of the following three fractions: one week interval between the first and second treatment and three weeks between the second and third treatment. The filter used was constantly equivalent to 3 mm of lead. The type of applicator varied, when ever possible a tube extending from the os to the fundus was inserted into the uterus. When necessary appropriate vaginal applicators were used simultaneously being held in place by a tampon.

At the author's request isodose curves for the different radium implants used were worked out mathematically by P. I. Jälvonen. In working out these isodose curves the absorption by the filters was taken into consideration but the tissue absorption was not considered. These isodose curves were drawn upon celluloid paper in natural size and were used in the clinical studies. By adding the amounts of the various isodose curves, the approximate intensity of the irradiation on any selected point in the tumor can be determined.

In the entire series 359 cases presented metastases to the lung or pleura, or both. A detailed analysis of the pulmonary series is unnecessary because the pathologist finds the maximum possible incidence. 1 carcinoma of the prostate approximately 27 per cent of the roentgenographically visible lesions are found within the thorax without skeletal metastases.

HAROLD C. OGDEN, M.D.

Hunt, H. B.: The Treatment of Large Protruding Carcinomas of the Skin and Lip by Irradiation and Surgery. *Am. J. Roentgenol.* 940, 44-54.

The large, protruding, bulky carcinoma of the skin or lip presents a discouraging and formidable appearance but experience shows that this type of tumor responds well to adequate treatment by irradiation or surgery. Statistical studies justify better prognosis for the bulky protruding tumor than for the ulcerating invading lesion.

Bulky squamous-cell carcinomas tend to be moderately to highly anaplastic and show an abundant delicate vascular network which is associated with moderately high radioactivity. The prognosis is reassuringly good since metastases to regional lymph nodes are remarkably infrequent, in view of the size and activity of the primary lesion. Deformity following eradication of the neoplasm by irradiation is surprisingly little because of only superficial invasion of healthy tissues by the neoplasm. The tumor can be successfully treated by roentgen rays, radium, surgery or combination of these agents, according to the individual problem or in keeping with the equipment and experience of the therapist. In general the thorax favors:

1. Surgical resection and plastic repair for Grade I carcinomas and radioresistant papillary tumors in general, and large tumors overlying the brain.

2. Irradiation of the base after removal of the protruberant portion of pendulous or polypoid carcinoma.

3. Preliminary roentgen-ray treatment followed by interstitial irradiation in the remnants of the base of the usual sessile tumor if and as indicated.

The defect after surgical resection can be closed by a skin graft, sliding flaps, or other reparative procedures. Repair by the thick split-graft speeds healing and gives a good cosmetic result. Surgical resection of a large papillary tumor of the lip by the average surgeon causes much more disfigurement and disturbance of function than irradiation. On the other hand, the deforming, invasive ulcerating carcinoma of the lip is better treated by surgery than by irradiation in case it is still resectable. The benign or low grade of papillary tumor is better treated by surgery than by irradiation because of the radioresistance of the lesion. JOSEPH K. NARAY, M.D.

Wigby, P. E. and Cohen, M.: Radiation Therapy of Carcinoma of the Skin; An Analysis of 83 Lesions in 70 Patients. *Radiology* 940, 35-70.

After brief review of the technique of radiation therapy of cutaneous carcinoma, as found in 11

articles collected at random from the literature the authors analyze the procedure used in their series of 83 lesions which occurred in 70 patients. They arrive at the following general conclusions:

Basal-cell carcinoma is best treated by low voltage roentgen therapy with dose ranging from 4,000 to 5,000 roentgens, at from 90 to 115 kv and with no filter or filter of mm. of aluminum. The entire dose is delivered within two weeks, most cases requiring less than seven days. For lesions 3 cm. in diameter from 600 to 1,000 roentgens reg. in daily, whereas for lesions more than 3 cm. in diameter the daily dose varies from 300 to 400 roentgens, the smaller dose being used for the larger lesion.

2. Intralesional, adenocarcinoma, and infiltrating basal-cell and squamous-cell lesions receive dose from 5,500 to 6,500 roentgens of medium or deep roentgen therapy at 145 kv and 1/16 filter of 5 mm. of aluminum, and at 200 k. with a filter of mm. of copper plus mm. of aluminum. In small lesions, 500 roentgens are given the first day and 600 roentgens daily thereafter. In larger lesions the irradiation is carried out with 300 roentgens daily.

3. A great variation in the dosage depending on the thickness and surface area of the lesion, is to be avoided. The use of radium is not recommended because of the great length of time required for such treatment.

THOMAS LECROIX, M.D.

Jacobson, V. C.: The Deleterious Effects of Deep Roentgen Irradiation on Lung Structure and Function. *Am. J. Roentgenol.* 940, 44-55.

This article is concerned chiefly with the reasons usually invoked for the persistence of a program of deep roentgen treatment of a suspected tumor of the lung. It also reviews the deleterious effect of roentgen rays when directed upon the lung.

In the main, the article is devoted to reporting in detail the case of a man, diagnosed clinically as having cancer of the lung, subjected to deep roentgen therapy over a period of nine years, and whose death was undoubtedly the result of the roentgen therapy and not directly of the neoplasm. A complete clinical and post-mortem study is included, and an attempt is made to correlate the symptoms with the pathology found at a autopsy.

The value of roentgen therapy in the treatment of cancer of the lung is emphasized but the pleural and pulmonary damage which may follow such measures should be kept in mind and guarded against as much as possible. An increase in such complications is prophesied unless improvements in radiation technique are forthcoming. The survival time following the demonstration of bronchial carcinoma either by means of the roentgen rays or biopsy is usually short, but this case demonstrated that roentgen therapy may prolong life very materially provided metastasis has not occurred. The sixteen-year interval between the original diagnosis and death is possibly the longest yet recorded for this type of neoplasm treated by non-surgical methods.

ANDREW HARRIS, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Busse Grawitz, P The Demonstration of Life in Tissues of American and Egyptian Mummies (Pruebas de vida en los tejidos de momias americanas y egipcias) *Semana med*, 1940, 47 287

Three methods of tissue culture are described by the author the first employs citrated plasma, the second semi-permeable collodion membranes, and the third subcutaneous implantations

Observations on tissue cultures of tendons from an embryo preserved thirty-eight years in alcohol, from a body of an Indian of a relatively remote epoch, and from Egyptian mummies established two facts (1) human tissues are able to produce reactions and form cells 5,300 years after the death of the individual, and (2) a homogeneous mass is able to create cells

The author succeeded in producing a formation of leucocytic cells in citrated plasma which served as a culture medium for tissues from Egyptian mummies These tissues had completely lost their differentiation, and had no nuclei, cells, or recognizable blood vessels The transformation of such a homogeneous mass into a proliferating, active conglomeration of cells is one of the marvels of nature The question arises What is the nature of the forces within our tissues responsible for a differentiation of the molecules into nuclei and cells, and their subsequent divisions? Poisons, light rays, time, or a combination of all these factors is unable to destroy such forces, they can be eliminated only by high temperatures The whole problem belongs to the mysteries of life

The aforementioned reactions of tissues from mummies refute Virchow's conception of cellular pathology and point to the molecular concept of pathology

The author's observations explain how a cancer, in spite of anatomical disintegration of its cells under the influence of x-rays or radium, is able after a number of years to form a recurrence.

JOSEPH K. NARAT, M D

Sorce, G Experimental Research on Fat Embolism (Ricerche sperimentali sull' embolia grassosa) *Speris mentale*, 1940, 94 164

For his experiments, Sorce used large rabbits and dogs and injected intravenously fat extracted from the subcutaneous fatty tissue or from the bone marrow of human subjects He found that the injections were followed by acute dilatation of the heart which sometimes assumed a grave aspect and was caused by (1) a serious disturbance of the nutrition of the cardiac muscle by the presence of emboli which obstructed many of the preterminal arteries and capillaries, and (2) an immediate, progressive, and enormous

demand following the introduction into the circulation of a fluid which has different physicochemical and physical characteristics from those of the blood and which is nearly entirely localized in the small circulation a few minutes after the injection The dilatation of the heart may be rapidly fatal but, if it is overcome, it regresses and disappears in from one to twenty-four hours because of the extremely profuse vascularization of the cardiac muscle which facilitates the elimination of the emboli

The disturbances due to changes in the nutrition of the heart (angina pectoris) are noted for their rapidity of occurrence and their immediate gravity, the author thinks that they offer great similarity to the cardiac disturbances presented by the animals during his experiments, namely, cardiac crises due to changes in nutrition with the addition of a serious mechanical obstacle

In 2 rabbits the author observed degenerative changes in the kidneys and, because no such changes were found in the other experimental animals, he is inclined to attribute them to the presence of a site of minor resistance brought to light by the introduction of fat into the venous circulation, rather than to embolism The fact that degenerative changes may occur in the kidneys in fat embolism has also been observed by other authors

The notable increase in the sedimentation rate of the red cells, observed by the author, is referred to the modifications which the fat embolism causes in the blood plasma by changing its physicochemical constants, logically, this should be an increase in the plasma proteins This conclusion is supported by the results of the determination of the refractometric index, which increased rapidly to reach its maximum in from five to ten days, remained stationary for a few days, and then decreased slowly to return to normal within one month It is known that the refractometric index increases with the increase of the protein content of the serum and that the substances with large molecules, the globulins, give the greatest refraction Consequently, the results show that fat embolism is accompanied by marked physicochemical changes in the plasma which consist of an increase in the proteins, which are more dispersed and have a larger molecule the globulins (fibrinogen, euglobulin, and pseudoglobulin)

The scarcity of nervous symptoms compared to the gravity of the cardiopulmonary symptoms imposes the conclusion that the usual cause of death in fat embolism lies in a grave cardiac crisis which finds its anatomico pathological expression in the acute dilatation of the heart, the presence of which is demonstrated by roentgen examination before death This cardiac crisis is determined first of all by a serious and immediate disturbance in the nutrition of the myocardium, as shown by histological examination of animals which died or were killed a few

minutes after the experiment was started, and, second, by serious and progressive mechanical obstacle as demonstrated by the injection of opaque fat into the circulation. The demand for marked functional activity in a heart which presents disturbances of nutrition seems to be the principal cause of the crisis, and of death if the possibilities of compensation in the myocardium are insufficient. The renal and the physicochemical changes found, similar to the changes in other disorders, prove that if the initial crisis is vertiginous, fat embolism causes complex general disturbances of such nature as to justify speaking of morbid reaction which finds its clinical expression in the disturbances presented by the animals during the days following the experiment.

RICHARD KRETI, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Caster, M. R., López García, A., and Zelasco, J. F. A Method of Determining the Amount of Bilirubin in the Blood; Total, Direct, and Indirect. The Reaction of Ehrlich-Prosscher and the Photometer of Pulfrich (*Sobre un método de dosaje de la bilirrubina en la sangre: total, directa e indirecta. R. de Ehrlich-Prosscher—Fotómetro de Pulfrich*). *Rev. Soc. argent. de Biol.* 1940, 6: 57.

The authors trace the successful improvements made in determining the amount of bilirubin in the blood since Van den Bergh first published his technique. Until lately the best method was that of Varela Fontes and Recart who made use of the capacity of chloroform when associated with a certain amount of sodium sulfate, to extract nearly completely the indirect bilirubin from the blood serum; the direct bilirubin was then determined in the serum remaining after treatment. The fact that some indirect bilirubin was always left in the serum made it appear that all sera contain direct bilirubin, which is contrary to all actual concepts of physiopathology. During 1939, Caster, López García, and Zelasco conducted a series of investigations which enabled them to develop a technique which, in their opinion, solves completely the problem of determining the total as well as the direct and indirect bilirubin.

The new technique is summarized as follows:

Tube No. 1.—total reaction. 1 c.cm. of serum, 3 c.cm. of distilled water, 1 c.cm. of calcium sodium benzoate at 5 per cent, and 1 c.cm. of diazo reagent.

Tube No. 2.—direct reaction. 1 c.cm. of serum, 4 c.cm. of distilled water, 1 c.cm. of diazo reagent, heat for fifteen minutes at 60° C.

Tube No. 3.—control. 1 c.cm. of serum, 5 c.cm. of distilled water and 1 c.cm. of calcium sodium benzoate.

The calcium-sodium benzoate may be prepared by mixing 30 gm. of pure calcium, 30 gm. of pure sodium benzoate, and 7 c.cm. of distilled water (to be heated and filtered).

Reading is done in the photometer of Pulfrich with a layer of appropriate thickness and filters S₃₃ and S₅₅ to obtain a thickness of 1 cm. The A values are 0 for S₃₃ and 1 for S₅₅. The values obtained with the filter which gives the highest amount in milligrams, are accepted as the most correct ones. In most cases, the values are the same but they may be lower for S₃₃ when the turbidity has not been exactly compensated.

When the values are low or normal, it is advisable to replace the distilled water in the three tubes by a solution of saccharose concentrated to the point of becoming syrupy. The increase in homogeneity of the medium makes it more transparent and may even allow its adaptation to colorimetric readings; this point is now being studied. Three cubic centimeters must be put in each tube, and 1 and 2 c.cm. of water must be added to Tubes 1 and 2, respectively, to make the amount of saccharose the same in each tube. The authors recommend the systematic use of the addition of saccharose because its advantages are evident.

In cases of uremia or of severe urubiliaemia, the readings with S₃₃ are more correct than those with S₅₅ because in this zone of the spectrum there is less absorption of the products of reaction with the diazo reagent (urobilinogen, bilirubinoids and conjugation products of phenol and benzol). In these cases it is safer to use the method of Hellmeyer and Krebs. The authors are now studying the solution of this problem, which is connected with the yellow reaction of Van der Fraenck. RICHARD KRETI, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 72

MARCH, 1941

NUMBER 3

SURGERY AND THE BASIC SCIENCES THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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SOME ASPECTS OF THE LIVER

NUTRITIONAL FACTORS WHICH AFFECT THE LIVER

DURING the past few years a number of dietary factors have been shown to affect the composition of the liver, particularly its fat content. It has been shown experimentally (5) that a low-protein, low-choline, and high-fat diet results in the production of livers with a high-fat content. Choline-free proteins have been evaluated with regard to their relative efficacy in preventing these fatty changes, and in the order of decreasing lipotropic activity these are gromax or whale protein, casein, albumin, beef-muscle protein, edestin, fibrin and gliadin, and gelatin and zein (11). It has been reported (36) and verified (10) that the lipotropic property of the various proteins is related to their cystine and methionine contents. The former amino-acid intensifies the fatty-liver-producing properties of the diet while the latter one tends to inhibit the accumulation of fat in the liver, having, in this respect, a similar action to choline (6). It is not apparent as to whether or not these two amino acids account for the entire action of protein in preventing the accumulation of fat in the liver.

In addition to the lipotropic action of choline, which was pointed out several years ago, it has been shown (22) that a choline deficiency in growing rats results in hemorrhagic degeneration

of the kidneys as well as in marked fatty changes in the liver. Cortical hemorrhages occur from ten to twelve days after the animals are placed on the diet, uremia and death are terminal manifestations of this deficiency. Sufficient amounts of casein or methionine in the diet reduce the choline requirements, while cystine tends to accentuate the lesions which result from choline deficiency (23). A cholesterol-rich diet has been shown (26) to be capable of producing fatty livers in animals when included in the diet in relatively large amounts. Choline is capable of preventing these fatty changes in the liver (8) although incapable of preventing the atherosclerotic changes which occur in the aorta of rabbits fed a cholesterol-rich diet (4, 35). Choline cannot prevent the infiltration but it hastens (7) the removal of the fat which accumulates in the liver during phosphorus or carbon-tetrachloride poisoning. It is not apparent from the literature whether or not the administration of choline will prevent the severe secondary anemia which has been shown to accompany the fatty liver and enlarged spleen produced by feeding a cholesterol-rich diet to guinea pigs (29). With radio-active phosphorus as an indicator, it has been shown (30) that choline facilitates the removal of fat from the liver by increasing the turnover of phospholipid in this organ, whereas cholesterol decreases this process. It has also been shown (27) that there is impairment of the bromsulfalein excretion from the blood of rats with fatty livers and that the

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administration of choline improves the excretion as well as reduces the fasting ketosis which occurs in these animals.

There is evidence to indicate that other nutritional factors are involved in the production and prevention of fatty livers in experimental animals. The effect of pancreatectomy on the fat content of the liver has long been recognized, and a thorough review and discussion of the literature pertaining to lipocae and to fatty infiltration of the liver in pancreatic diabetes has recently appeared (12). It has also been shown that ligation of the external ducts of the pancreas results in fatty infiltration of the liver and causes changes in the blood lipids (14, 3). These changes can be prevented by the feeding of raw pancreas (15) and choline (15) will also prevent the fatty infiltration of the liver that accompanies experimental pancreatic trophy. Water-soluble meat extractives have been shown (31) to be of consequence in the production of fatty infiltration of the liver following ligation of the pancreatic ducts, since a diet minus these extractives failed to produce the fatty changes while their addition caused the fatty changes such as occur when whole meat is fed. Vitamin B₄ deficiency has also been shown to cause fatty livers in the rat (34).

The effect of various dietary factors in increasing the resistance of the liver to injury has been studied by several groups of investigators. The importance of an adequate carbohydrate intake in the treatment of diseases of the liver has recently been reviewed (34). This review points out the necessity for the intravenous administration of glucose in instances in which an adequate hyperglycemia cannot be obtained by the oral administration of carbohydrate. The use of insulin in conjunction with a high carbohydrate diet is discouraged in the non-diabetic patient on the basis that the administration of insulin increases the peripheral uptake of sugar and thus stimulates the hepatic output of glucose. The object of maintaining a hyperglycemia is to suppress the hepatic output of sugar and permit the storage of glycogen. The blood-sugar level is indicated as the criterion of the adequacy of the carbohydrate intake and it is emphasized that this intake must be generous to be effective. The effect of diet upon the resistance of the liver to injury by chloroform has been studied in the rat (30). The authors correlated the susceptibility of the liver to injury by chloroform with the fat and glycogen content of this organ. They believe that the protein content of the diet is of greatest importance in the prevention of liver injury by chloroform. The protective action of a protein rich diet,

consumed for some time prior to exposure to the chloroform, is ascribed to the lower fat content of the liver resulting from such a diet and to the protein reserve which accumulates. Carbohydrates are considered of importance in that they serve as protein spacers, but no particular protection is ascribed for so far the presence of glycogen in the liver. Results of a study (9) of the resistance of the liver to injury by carbon tetrachloride showed that the greatest resistance to this intoxicant occurred on a high-carbohydrate diet. Greatest susceptibility was observed on a fat-rich diet, while regeneration was most marked on a high-protein diet. The protective action of an extract of the liver against acute poisoning with carbon tetrachloride was reported in 1936 (17, 18). Since that time further studies have shown that the active principle of this liver extract is xanthine (18). The effect of this liver extract and of xanthine in protecting against this central necrosis has been confirmed (3) but the mechanism of action is not known, although any effect on the rate of liver regeneration appears to have been excluded (16). That the action of xanthine is not a specific one is indicated by the fact that India ink, tertiary calcium phosphate, and sodium ricinoleate also furnish protection (19). It has been suggested that some reaction at the site of injection may cause the protection observed. All of these substances lower the serum esterase elevation which results from chloroform or carbon tetrachloride intoxication. Selenium has been shown (1) to produce toxic symptoms and cirrhosis of the liver in a number of different experimental animals. A high protein diet (3, 33) affords some protection against this poison. Also, arsenic, either as arsenite or arsenate has been reported (13) as capable of protecting against poisoning by selenium. The mechanism of this protection is still obscure.

SERUM PHOSPHATASE AND DEFENSES OF THE LIVER

Since the first experimental and clinical demonstrations (3, 5) of the increase in serum phosphatase which follows obstruction of the common bile duct, a number of publications (4, 5, 8, 9, 10, 11, 12, 16, 17, 19) have appeared on the alterations in activity of this enzyme which occur in liver disease. There has been considerable difference of opinion as to the value of the serum phosphatase determination as diagnostic aid in determining the origin of jaundice. The majority of investigators have agreed that the greatest elevations of serum phosphatase occur most frequently in extrahepatic obstructive lesions.

Elevation of the serum phosphatase also occurs in hepatocellular jaundice, and while the elevation is less marked there is sufficient overlapping of the serum values to cause some authors to conclude that this test has no diagnostic significance in distinguishing a hepatitis from an obstruction of the common bile duct. Practically all authors agree that there is very little or no elevation of the serum phosphatase in hemolytic jaundice which is uncomplicated by liver obstruction or hepatitis.

The simultaneous determination of serum phosphatase and bilirubin in patients with jaundice has been proposed (16) as an additional aid in the interpretation of the serum phosphatase. These workers found that in an obstructive jaundice the serum phosphatase and bilirubin tend to parallel one another until the limit of phosphatase values is obtained, while in a non-obstructive jaundice (hepatitis) the continued rise in bilirubin is not paralleled by the increase in serum phosphatase, since the latter, in their experience, rarely rose above 10 units.

The serum phosphatase may also be elevated in liver injury which is unaccompanied by jaundice. Poisoning by certain solvents, such as carbon tetrachloride, has been shown experimentally (7) to cause a serum-phosphatase elevation of several times normal unaccompanied by any elevation of the icteric index of the serum or of bile-pigment excretion in the urine of experimental animals. In experimental obstruction of the common bile duct (1) an elevation of the serum phosphatase precedes by a number of hours any significant elevation in the serum bilirubin, and after the common bile duct obstruction has been relieved the serum-phosphatase elevation only slowly recedes to normal and persists at a high level long after the icteric index is normal. It has also been demonstrated (6) that the transfusion of blood from a dog with obstruction of the common bile duct leads to a much more prolonged elevation in the recipient of the serum phosphatase than of the bilirubin. These observations all tend to indicate that the serum-phosphatase elevation may be a much more sensitive indication of liver involvement than the serum bilirubin. Perhaps one of the greatest fields of usefulness of the test is in detection of disturbances of the liver with insufficient impairment of function to be demonstrable by other means. Diseases of the bones would necessarily have to be excluded. It has been shown that the hepatitis caused by arsenical therapy (11) may be accompanied by an elevation of the serum phosphatase and it is possible that the incipient hepatitis caused by this and other chemical agents, such as certain

volatile solvents, might be demonstrable, particularly if one followed the serum activity of this enzyme from the beginning of exposure to the potential injury. This test might be useful in the control of arsenical therapy.

It has been assumed by some investigators (13, 18) that the serum phosphatase originates solely in the bones and that its presence in bile is the result of excretion from the serum as is the case with bilirubin. There is both experimental and clinical evidence which suggests that such may not be true of the serum-phosphatase elevation which occurs in liver disease. In acute yellow atrophy of the liver or congenital atresia of the bile duct the serum phosphatase may be relatively low while the serum bilirubin is relatively high (10). If the enzyme is extrahepatic in origin there should be a serum rise similar to that of bilirubin. Experimental evidence is also available which supports the view that the enzyme may, at least in part, originate in the liver. Obstruction of the hepatic bile ducts of approximately one-third of the liver results in a definite elevation of the serum phosphatase without any jaundice in the dog (7). Extirpation of a similar amount of liver leads to only a slight and transient elevation of the serum phosphatase. In each instance the excretory capacity of the liver has been similarly reduced for at least a short period of time. The injection of acacia into the circulation of the dog has been shown (2) to increase the serum phosphatase and to lower the total cholesterol and the cholesterol esters of the serum. These findings were interpreted as evidence of the non-osseous origin of serum phosphatase.

The assumption that the serum-phosphatase elevation associated with liver disease originates in the liver results in a useful approach to the interpretation of the serum findings in any given instance. The phosphatase increase in the serum in liver disease becomes the result of the ability of the liver to produce the enzyme and its accessibility to the circulation. In diseases which destroy the parenchyma of the liver, such as cirrhosis, the enzyme elevation in the serum would be less as the cirrhosis progressed and the parenchyma was replaced by fibrous tissue. In acute yellow atrophy of the liver in which the function of the liver is greatly reduced, the slight increase of serum phosphatase and marked jaundice would indicate that the liver has lost both its ability to excrete the pigment and to form the enzyme.

LIVER FUNCTION TESTS

1 *Jaundice—Pigment changes in the urine and feces*. Recent studies (33, 37, 38) have added

much to our knowledge of the urinary and fecal excretion of urobilinogen in health and disease. The daily normal output of urobilinogen according to one method (37, 38) is 0.4 mgm. in the urine and from 40 to 180 mgm. in the feces. According to another method (33) the normal figures are from 150 to 300 mgm. per 100 gm. of stool and from 1 to 8 mgm. per cent in the urine. The normal values for fecal elimination are about twice as high by the latter method and the author of this method believes that some loss occurs in the other procedure.

Studies of urobilinogen elimination are of value in detecting and following the progress of hepatic disease (33) as well as in the differential diagnosis of intrahepatic and obstructive jaundice (33, 38, 41, 42). Such studies also help to differentiate between malignant biliary obstruction and obstruction due to other causes (33, 38, 41). Jaundice due to stone and to diffuse hepatic disease is not accompanied by complete obstruction or cessation of the bile flow (as evidenced by less than 5 mgm. of urobilinogen daily in the feces and none or only a trace in the urine) on the other hand, this is a constant finding in obstructive jaundice due to neoplasm (33, 38, 41). The determination of urobilinogen in the urine is emphasized as valuable in the diagnosis of complete external biliary obstruction (42). Diffuse hepatic disease is usually characterized by a marked increase in urinary urobilinogen. Jaundice due to stone is not accompanied by any considerable increase in urinary urobilinogen unless such complications as acute cholecystitis, cholangitis, or biliary cirrhosis are present (38). Fecal urobilinogen is markedly increased in hemolytic jaundice (33, 38) and serves as an index of red blood-cell destruction (33).

The analytical methods of Watson are too difficult for general clinical use (33, 35). Several practical disadvantages have been pointed out (35): (1) the urine and stools require hours of preparation by a skilled chemist; (2) urinary urobilinogen is directly influenced by fever, insomnia, and physical activity; and (3) the stool estimation is often unreliable since it is frequently impossible to get 4 daily consecutive normal stools in patients who have nausea and vomiting and often require liquid diets. Sparkman (33) claims simplicity, rapidity and clinical adaptability for his modified method and believes that valuable clinical information can be obtained from single urine and stool specimens. It is believed (5) that such studies will prove to be valuable tests of liver function as well as an aid in differential diagnosis.

2. *Hippuric-acid test.* The hippuric-acid test is thought to be of greatest value in prognosis (31, 32, 42, 43) and in the estimation of surgical risk (31, 32, 42). It is a reliable index of the degree of liver damage present (3, 4, 6, 14, 26, 31, 32, 42, 43, 44). The test has been found to be more reliable than the cholesterol-ester percentage in the prognosis of acute liver disease and far more reliable in chronic cirrhosis and gall-bladder disease (43). It has been found (6) to be a valuable aid in the detection of liver damage in cases of jaundice and in some cases of cholecystitis and cholelithiasis. The results of the hippuric-acid test in jaundiced patients correspond in general to the degree of hepatic injury seen at operation or autopsy (31). A reduction in hippuric acid elimination to 50 per cent or less means severe parenchymatous liver damage and a greatly increased surgical risk (32). Some (3, 4) believe that this test possesses most of the advantages and lacks most of the disadvantages of other liver-function tests. It has been found (3, 4) to be of value in determining liver damage in hyperthyroidism. A comparative study of the plasma prothrombin level, hippuric-acid test, galactose tolerance, bromsulphalein excretion, and plasma fibrinogen levels (44) has shown the prothrombin level and hippuric-acid excretion to reflect most sensitively and consistently the amount of liver damage present. The patients did not have jaundice or biliary fistulas.

The value of the hippuric-acid test in the differential diagnosis of jaundice is supported by some (26, 43) and denied by others (33, 42, 43). It is probably of value in differentiating intrahepatic jaundice from obstructive jaundice of short duration. However in long-standing obstruction, its value is limited.

Extrahepatic factors to be considered in the interpretation of the hippuric-acid test have received considerable attention (14, 25, 31, 42, 43, 45). The importance of normal kidney function has been emphasized by several authors (14, 31, 42, 43, 45). Some (45) believe that the test is of no practical value and is contraindicated in advanced renal disease. The simultaneous determination of urea clearance enhances the value of the test (4). It has been reported (35) that the usefulness of the test is not affected by impaired renal function unless this is so severe as to be accompanied by urea retention. Other factors which limit the value of the test are cardiac decompensation (45), dehydration (31, 42, 43), malnutrition, and gastric retention (31).

Various modifications of the test have been suggested. A new technique for the determina-

tion of hippuric acid in the urine has been described (39). Abbreviation of the test to a two-hour period is reported (25) as satisfactory for most clinical purposes. Intravenous modifications of the test have also been described (19, 27, 28). This technique insures accurate dosage, avoids difficulties with vomiting, and requires less time and a smaller volume of specimen, as well as a smaller dose of benzoate (19).

PRECIPITATION AND FLOCCULATION TESTS

1 *Takata-Ara test* Considerable attention has recently been directed toward this test. Most workers agree that it is not specific for cirrhosis of the liver (5, 7, 11, 12, 13, 22). The test is positive in slightly over 50 per cent of cases with moderately severe hepatic damage and hence is not specific for any single disease of the liver (5, 12, 22). It is positive in most malignant involvements of the liver and may be positive in cases in which the liver is enlarged as a result of cardiac failure (5). It is occasionally positive in patients without liver damage (5, 13, 22). The test is correlated to a great extent with changes in the albumin-globulin ratio (22) and is likely to be positive in any disease in which the globulin level is elevated (13).

The test may be negative in early cirrhosis, becoming positive later in the disease (7, 26, 31). It is of more value in prognosis and in the estimation of surgical risk than in diagnosis (22), as it becomes less positive and even negative as the patient improves (7, 22). Horejsi (11) found the test positive in 83 per cent of his cases of cirrhosis and believes that this is valuable confirmatory evidence in the diagnosis of cirrhosis. In general, a positive test confirms the diagnosis of cirrhosis whereas a negative test would lead one to question the diagnosis (23).

The T-A test is a much less sensitive indicator of hepatic injury than the dye test (22, 31), becoming positive only when liver damage is considerable (7, 22). Others state (2) that the test is not significant enough to be of value in the clinic as an additional laboratory procedure.

2 *The Weltman serum-coagulation reaction* This test, introduced by Weltman (40) in 1930, has been used extensively in Europe but has received little attention in this country. Only five references have been found in the American literature. The test is by no means specific for diseases of the liver. It is not diagnostic of any disease but is a non-specific reaction which aids in distinguishing exudative from fibrotic processes (17, 18). It appears to be of diagnostic and prognostic value especially in tuberculosis and rheu-

matic fever. A number of workers (6, 16) have applied the test primarily to diseases of the liver. These authors believe it to be of value in the differential diagnosis of obstructive and parenchymatous jaundice. The fact that the test was usually normal in obstructive jaundice whereas a shift to the right in the C B (coagulation band) accompanied parenchymatous liver damage was also noted by other workers (17). It has been reported (6) that this test appears to be the most delicate method of detecting early liver damage.

3 *Blood-serum colloidal-gold curve* Studies on the colloidal gold curve of the blood serum in cases of liver disease have recently been reported (8). The technique of the test, except for certain details of dilution and pH adjustment, is essentially the same as the familiar Lange spinal-fluid test. A positive test (as indicated by a parietic type of curve) was found in 89 of 96 patients with various types of liver disease. In 34 of these cases, the diagnosis was proved by autopsy, biopsy, or laparotomy. The test was negative in 20 normal adults and in 73 of 75 patients with various extra-hepatic diseases. A positive test may be related to an increase in the euglobulin fraction of the blood proteins.

DYE EXCRETION TESTS

Retention of bromsulfalein is constantly associated with histological evidence of liver damage as proved by autopsy or at operation, and in the absence of jaundice, this test is probably the most practical now available (1, 32), information obtained from it is as reliable as can be gained in any other way (31). It is of value in prognosis and in estimating surgical risk (1, 20, 31). However, there is evidence (24) which indicates that the removal of bromsulfalein from the blood stream is a function of the entire reticulo-endothelial system of which the liver is only a part.

It has been found (29) that the azorubin-S-excretion test is as reliable as the bromsulfalein test and better than the hippuric-acid test in cirrhosis, while in relatively early cases of chronic hepatitis, it excels both of these tests.

TESTS OF CARBOHYDRATE METABOLISM

Galactose tolerance Some (30) believe that this test done properly early in jaundice still remains the most reliable single laboratory test for the differential diagnosis of obstructive and toxic jaundice. The value of the test in this connection is supported by others (6, 36, 41). It has been pointed out (36) that its differential value is lost in cases of chronic jaundice as well as in early obstructive jaundice accompanied by inflamma-

tion of the biliary passages. Others (31) believe that the test is unreliable for the differentiation between intrahepatic and obstructive jaundice. These workers found the test consistently negative in portal and biliary cirrhosis, and in their experience, the test had no value whatever in patients who were not visibly jaundiced. The blood galactose level following oral administration has been determined (32). A normal tolerance was found in obstructive jaundice and an abnormal result was obtained in toxic jaundice and hyperthyroidism. The author believes the test to be of value in the demonstration of parenchymatous liver damage.

Leucose tolerance. This test has recently been modified to the extent of estimation of the blood leucose level instead of the total blood sugar as originally described (9, 10, 33). Thus errors due to variations in blood glucose levels are avoided. Diabetes is believed by some (31) to interfere with the test. This is denied by others (10, 34). Apparently the test is not very sensitive, and in chronic liver disease, clinical signs and symptoms usually precede the development of a positive test (10). It is reported (6) that the test is not delicate enough to be used as a routine procedure. In general, its field of usefulness is limited (31).

MECHANICAL CAUSES OF LIVER DAMAGE

1. *Chronic passive congestion.* A number of recent articles have dealt with the effects of cardiac failure on the liver. The literature has been reviewed up to 1938 (1, 8) and the reviewers give the results of their own studies on 75 cases of cardiac disease in which prolonged single or multiple episodes of congestive heart failure occurred. These authors describe three types of changes occurring in the liver:

1. The usual histopathological picture was that of a central lobular atrophy or necrosis or both. This occurred in 49 per cent of their cases.

2. The next most common finding was central lobular atrophy or necrosis together with a condensation and thickening of the hepatic reticulum but without true cirrhosis (44 per cent). Finally actual hepatic cirrhosis occurred in 7 per cent. In these cases there was marked degeneration with complete destruction of entire lobules in scattered regions. Reversed lobulations were a prominent feature. Patchy areas of fibrosis and regions of adenomatous regeneration of hepatic tissue were seen. There was an increase in the number of lymphocytes and bile ducts. The authors conclude that true cirrhosis developing in the course of congestive heart failure does occur but it is rare and suggest that cirrhosis occurs in

cases having repeated episodes rather than in those with prolonged failure.

On the basis of a study of 2,000 autopsies (including 236 cases with chronic passive congestion) it has been reported (6) that cardiac cirrhosis, signifying a morphological increase in liver connective tissue consequent to congestive failure, occurs in the majority of patients who have suffered from even mild congestive failure for nine months or more. Although central fibrosis seemed to be peculiar to these cases, periportal fibrosis also occurs. However clinical cardiac cirrhosis with extreme fibrosis and evidence of portal obstruction is rare. Other workers state () that a persistent rise in venous pressure was found to be associated with a highly characteristic fibrosis of the liver based on altered hemodynamics. Probably chronic anoxia is also an etiological factor.

Biliary obstruction. Mechanical obstruction of the biliary passages may be caused by stones, intrinsic or extrinsic tumors, enlarged lymph nodes, parasites, pancreatitis, inflammatory or postoperative strictures and adhesions, or congenital anomalies.

Recently 244 cases in which necropsy showed biliary obstruction and obstructive jaundice have been studied (3). The obstructive lesion was neoplastic in 64.3 per cent and benign in 35.7 per cent. Using parenchymatous atrophy, fibrosis, and nodular parenchymal regeneration as their diagnostic criteria, these authors found true hepatic cirrhosis in 8.6 per cent, or 1 case. In 16 of these the obstruction was benign (10 post-cholecystectomy stricture, 6 cholelithusis) in 5 malignant. Since benign obstructions constituted only 35 per cent of the total number of cases and yet made up 75 per cent of the cases with cirrhosis, the higher incidence of cirrhosis in benign obstruction is very apparent. This fact has been noted by others (3, 4, 5, 7). In this connection it is of significance to note that the average duration of life after the first appearance of jaundice was three and eight tenths years for the benign obstructions and only one-half year for the neoplastic obstructions.

The microscopic changes associated with obstructive cirrhosis consisted of widespread parenchymal degenerative changes which were usually most marked around the central vein, a moderate to marked increase in portal connective tissue, areas of parenchymal regeneration like thrombi, an increase in the interlobular bile ducts, and collections of lymphocytes and polymorphs. These workers (3) suggest that the infrequent combination of biliary obstruction, obstructive jaundice and true hepatic cirrhosis be

called "cirrhosis from biliary obstruction," and that cases showing hepatic parenchymal damage without signs of regeneration should be classified as hepatic atrophy. Hepatic infarction has also been noted (9) in periarteritis nodosa and myelogenous leucemia.

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THE RELIEF OF DEAFNESS IN OTOSCLEROSIS BY FISTULIZATION OF THE LABYRINTH

Collective Review

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THE surgical relief of otosclerotic deafness has been an intriguing problem among otologists for many years, especially since no other form of treatment has had any beneficial effect. This deafness is due to the fixation of the foot plate of the stapes in the oval window by new bone formation. The surgical solution has generally been assumed to be the establishment and maintenance in some other part of the labyrinth of a substitute window, covered by a thin flexible membrane, to take over the function normally exercised by the oval window. That this assumption is correct is shown by the immediate improvement in hearing following the various procedures directed toward this end. The subsequent loss of this improvement has been due to the rapid closure of the artificial fistula in the labyrinth by bone regeneration.

Kessel, in 1876, attempted to remove the foot plate of the stapes and have it replaced by a cicatricial membrane. This procedure was a failure because of the difficulty of removing the foot plate and the danger of infection entering the labyrinth from the middle-ear cavity.

In 1897, Passow elevated the periosteum over the promontory, trephined a window into the labyrinth, and covered the opening with the previously elevated periosteum. Unfortunately, the marked improvement following this procedure lasted only a few days, and the danger of labyrinthine infection could not be excluded.

Because of the danger to life, and the fleeting nature of the improvement in hearing, these methods were generally and vigorously opposed by the leading otologists of that time.

About 1910, Barany suggested making a fistula in the posterior vertical semicircular canal, to avoid the danger of infection of the labyrinth. When he performed this operation, the immediate improvement in hearing was marked, but lasted only two weeks.

In 1914, Jenkins (5) opened the horizontal canal in 2 patients, covering the fistula in one case with a Thiersch skin graft and in the other with a flap

from the external auditory canal. There was marked improvement in the hearing immediately, but shortly afterward one patient's hearing fell below the pre-operative level and the other patient became totally deaf.

In 1917, Gunnar Holmgren (3) resected the bone between the summit of the anterior vertical canal and the dura, utilizing the latter for the covering membrane. In 1 case operated on by this method, the improvement in hearing was good but lasted only a short time.

When Robert Barany was in this country, in 1922, he described a two-stage operation which he had devised and performed (1).

1. A preliminary mastoidectomy was performed with an attempt to wall off the tympanum by filling the mastoid cavity with transplants of fat.

2. Some weeks later the mastoid was reopened and a fistula made in the horizontal canal. A strip of fat was then inserted into the fistula in an endeavor to keep it open. Here, again, the immediate results were good but the improvement lasted only two weeks.

While much has been written on this subject in recent years, a clear understanding of the evolution and present status of this problem can probably best be reached by a review of the work of Gunnar Holmgren of Stockholm, Maurice Sourdille of Nantes, and Julius Lempert of New York.

HOLMGREN

In 1920, Holmgren (4) operated by making a fistula in the promontory and covering it with the mucoperiosteum of the promontory itself. The results were fairly good but did not last long. He reported these cases at the Otorhinolaryngological Congress at Paris.

In 1922 he performed a similar operation on the horizontal canal, covering the fistula with the mucoperiosteum of the canal itself.

Over a period of fifteen years he operated by variations of this method on 35 patients whose hearing was too bad to enable them to follow their usual vocations.

The immediate improvement in hearing was remarkable, but lasted only a few weeks. In some

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of these cases, however a slight improvement persisted over a fairly long period and the patients were enabled to resume their work.

SOURDILLE

After seeing Holmgren's work in 1924, Maurice Sourdille (9) of Nantes, France, enthusiastically attacked the problem and devised an operation which he called tympano-labyrinthectomy. Briefly, this operation is designed to create a thin, epithelialized membrane of scar tissue to provide a covering for the fistula in the horizontal semicircular canal, and to incorporate this fistula in the reconstructed tympanic cavity. It is performed in three or more stages.

1. The skin and peristernum of the postero-superior walls of the auditory canal are removed and the denuded bony area is allowed to heal with a thin epithelial membrane which is later utilized to cover the fistula in the canal.

2. Four or five months later a radical mastoid operation is performed, the head of the malleus is resected, and the membranous flap is placed so as to seal off the tympanic cavity and cover the site of the horizontal canal.

3. After this has healed, in four or five months, that part of the flap over the horizontal canal is elevated and a fistula is made, which fistula is immediately re-covered with the flap.

4 and 5. If the hearing diminishes postoperatively indicating a closure of the fistula, the third stage of the operation is repeated at intervals in an endeavor to obtain a permanent opening.

Sourdille states that as soon as the canal is opened, "the increase in hearing seems considerable, ten, twenty times and even more than the preoperative hearing distance." The hearing which ordinarily decreased in the days following the operation increases as soon as cicatrization has taken place, and attains or even surpasses the hearing observed on the operating-table, the moment the labyrinth is opened. He states that manometer readings show that an air pressure from 2 to 6 c.m. of water will produce a definite horizontal nystagmus and definite vertigo. He continues as follows:

In a great number of cases, unfortunately the success is ephemeral: four, six, or ten weeks later one sees the aerial hearing diminish, and at the same time the air pressure in the meatus can attain 40 and even 60 c.m. of water without determining nystagmus, nor a sensation of vertigo.

"This is due to the fact that the labyrinthine fistula closes, due to the reconstitution of a rigid bony layer which rarely attains the thickness of

the primitive bony canal, and more often does not exceed a few tenths of a millimeter. It suffices, in a complementary operation to extract this bony film, to see the hearing gain of the first operation return, sometimes be even greatly increased. The time the result will be lasting, the regenerative process of the bone becoming gradually exhausted. In many cases, however I had to open the labyrinth three times.

In 1935 Sourdille reported at the Congress of Paris as follows:

Number of patients operated on	99
Number of operations performed	151
Positive results	74 per cent
Very good results, ten times and more than previous hearing distance	40 per cent
Good distance, from five to ten times previous hearing distance	4 per cent
Mediocre results, from one to five times previous hearing distance	20 per cent
Fatalities	None
On October 6, 1937 the number of patients exceeded	100
Number of operations	150

He stated that he was now able to obtain positive results in 80 per cent, of which 60 per cent were superior by ten times to the pre-operative hearing distance.

He says, "I have had in mind, primarily the creation of a surgical technique giving very important practical hearing results, and creating an impression on the patient and his immediate relations, but I hope that in the future a precise audiometric measurement will permit us further to improve the method and especially its indications and contraindications."

It is difficult to evaluate Sourdille's work because as far as I can learn, few otologists have witnessed his operations or had the opportunity of examining his patients. Holmgren (4) in the course of a careful analysis of the 109 cases Sourdille reported in 1935, calls attention to the fact that 20 cases were listed as non-terminated and 5 cases as not followed up. Of the remaining 68 cases, 41 were said by Sourdille to have shown improvement. Holmgren calls attention to the fact that there were 11 cases with stapes and ossicle tubes and not less than 20 cases of tube occlusion and that no information is given as to roentgen examination. Audiometric tests are generally lacking.

Besides the usual sources of error in testing hearing with the whispered and spoken voice Holmgren mentions the following:

1. Different examining rooms give very different results.

2. No examiner is able to control exactly the degree of voice used for different examinations.

3 Patients who are repeatedly examined become trained and a guessing factor also has to be considered

4 Patients with very poor hearing lose the habit of listening (This attention factor may later be stimulated)

5 Hearing in otosclerotic patients is often variable

Analyzing the 41 cases which showed improvement, he selects about 12 in which he believes the errors of voice testing could account for the improvement, and concludes

"In a moderate number of cases the definitive results appear to me to be so far above hearing before operation that one must assume that at operation a sound fistula must have been established which remained functioning over a period of years"

HOLMGREN

In 1935, encouraged by Sourdille's optimistic reports, Holmgren again attacked, along different lines, this problem of establishing a permanent fistula. Believing that the closure of the fistulas by bone was due to the fact that he had covered them with bone-forming tissue, i. e. periosteum or dura, he endeavored to obtain a non-bone-forming lining of the mastoid cavity to be utilized as a cover for the fistula. He tried Thiersch skin grafts (one of which was successful), fat (as Barany had done), and various prostheses—rubber, Stent's mass, and paraffine. In one series of cases he placed gold leaf over the fistula to prevent the fat's adhering to the membranous canal. In some cases the endolymphatic sac was exposed.

At the Otorhinolaryngological Congress in Berlin, in 1936, he presented 6 cases which had been operated on by this method from one to twelve months previously. Before operation the patients heard conversational voice at from 0.3 to 0.6 meters. At the presentation one heard conversational voice at 4 meters and the others at 10 meters. However, the improvement disappeared in nearly all of the cases after a lapse of from eighteen months to two years. In the cases which were reoperated on, the fistulas were found closed with bone. After this bone was removed, the hearing was again temporarily improved.

Noting the fact that fistulas caused by cholesteatoma tend to remain open and that these fistulas are covered by a thin pavement epithelium, and noting also his successful result with the Thiersch skin graft, and Sourdille's favorable reports in the cases in which the fistula covering was of thin connective tissue covered with pavement epithelium, he thought that this type of

covering might be responsible for the fistulas' remaining open. In order to test this possibility, he operated on a series of cases by performing a "conservative radical" operation, sealing off the tympanum from the mastoid cavity. After the mastoid cavity had become lined with a thin, pavement epithelial membrane, it was reopened, the epithelial membrane elevated over the horizontal canal, the fistula made, and the epithelial membrane replaced over the fistula. While the immediate results were good, sufficient time has not elapsed to report on the permanence of the results.

Holmgren believes, as a result of his many years of work on this problem, that in spite of some successes by various methods, "the requirements for maintaining permeability of a bony fistula have, therefore, not been discovered, and will consequently have to be the subject of further study."

As a result of this belief, he performed a series of experimental operations on monkeys, whose labyrinthine capsule is rather like that of the human being. He tried to produce fistulas by prolonged pressure erosion, and to prevent new bone formation by grinding bone dust into the haversian canals, by means of the electrolytic action of various metals, by irradiation with radium, and by covering the fistulas with peritoneum, thin fascia from the temporal muscle, and Thiersch skin grafts. In other cases a thin, platinum wire was introduced into the canal and allowed to remain, to render possible a permanent decompression of the perilyabyrinthine pressure.

After various periods of time, from twenty-three to three hundred and sixty-five days, the animals were killed and the temporal bones sent to Professor F. R. Nager (8) for histological examination, who reported that in all the specimens the fistulas were closed by bony tissue which had developed from the periosteal layer of the labyrinthine capsule. The enchondral layer showed no reaction, while the endosteal layer showed some connective-tissue formation.

He did note, however, that in those cases in which squamous-celled epithelial tissue was implanted in the fistula bone production seemed to be less. In the cases in which radium had been used, bone regeneration was greatly reduced.

LEMPERT

In this country Julius Lempert (6, 7), who has been working on this problem since 1926, has devised a one-stage operation which consists of

"1. Creation of a trough-like fenestra in the bony capsule of the external semicircular canal



Fig.

Fig. 1. The endaural incisions have been made and the triangular membranous flap has been removed.

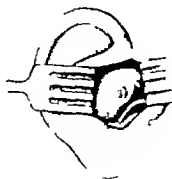


Fig.

Fig. 2. The illustration shows the antiauricular exposure



Fig. 3.

of the mastoid process.

Fig. 3. Note the exposure and sharp dehiscence of the external semicircular canal.

with the aid of a dental polishing and burnishing burr. This fistula is created in order to replace the non-functioning fenestra ovalis and thus to mobilize the labyrinthine perilymph and endolymph for air-borne sounds.

"2. Incorporation of this newly created fenestra within the confines of a newly reconstructed, air-filled and hermetically sealed tympanic cavity.

"3. Reconstruction of the osseous external canal to permit access of sound waves directly to the newly created fenestra in the external semicircular canal.

This operation he performs under combined analgesia and local anesthesia, through his "endaural antiauricular approach to the temporal bone," i.e. through the external auditory meatus instead of the usual postaural mastoid incision.

He first removes a triangular flap from the outer third of the posterior and superior walls of the auditory canals. This window is then mobilized by elevating the periosteum over the outer surface of the mastoid and the posterior root of the zygoma. The antrum is opened with an electrically driven burr; all surrounding cells are removed and the horizontal canal is sharply outlined.

From this stage on, the technical difficulties of the operation greatly increase. The tympano-mastoid cutaneous membrane which is later to be utilized in reconstructing the tympanic cavity and covering the fenestra in the horizontal canal, consists of the thin lining of the bony external canal

(except the antero-inferior portion) and the tympanic membrane including Shrapnell's membrane. Obtaining this flap intact, without separation of the mastoid portion from the tympanic portion at the site of the annulus tympanicus and without perforation of the tympanic membrane is a task of the greatest difficulty and delicacy. It is best accomplished first by skeletonizing the bone and then by removing the thin, bony cortex from the membrane in tiny fragments, rather than by attempting to elevate the membrane from the bone. This is done in the following order:

The posterior canal wall is skeletonized to a point level with the vertical portion of the facial canal. The posterosuperior canal wall, with any remaining cells, is next skeletonized. This exposes the posterior portion of the locus. This skeletonization is then extended anteriorly until the entire attic is exposed and the anterosuperior canal wall is skeletonized anteriorly beyond the notch of Rivinus.

The skeletonized bone is then removed, millimeter at a time up to the sulcus tympanicus. This structure is then skeletonized, posterior and anterior to the notch of Rivinus, until it fractures spontaneously. The minute fragments are removed from the fibrocartilaginous ring of the tympanic membrane. The bone above Shrapnell's membrane is now skeletonized and removed. In order to permit this membrane to be swung posteriorly to cover the labyrinthine fenestra, it

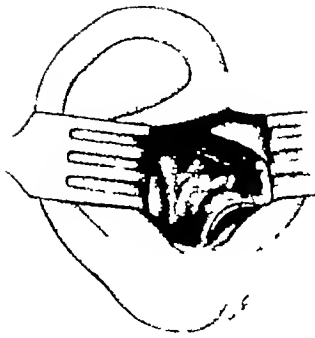


Fig 4

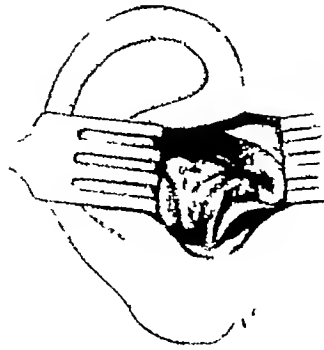


Fig 5

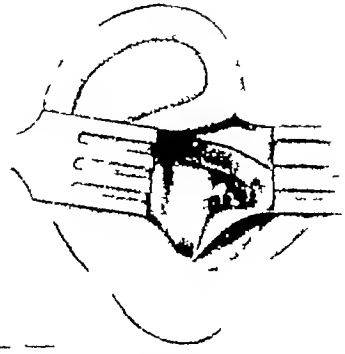


Fig 6

Fig 4 Note the exposure of the incudomalleolar joint and the anterior malleolar ligament.

Fig 5 The tympanomeatal cutaneous membrane has been created. The long crus of the incus and the chorda tympani nerve are exposed to view.

Fig 6 The head and neck of the malleus are amputated. The incudostapedial joint, the chorda tympani nerve, and the tendon of the tensor tympani muscle are exposed to view.

must be freed from its attachment to the ossicular chain. This is accomplished by separating the malleus from the incus and then resecting the head and neck of the malleus with a specially designed instrument. It must be done without disturbing the incus.

Fenestration of the horizontal canal requires the utmost delicacy and patience and must be completed without injury to the membranous labyrinth. Under brilliant illumination and powerful magnifying glasses, the bone is slowly worn down with a dental polishing burr, the operator waiting whenever necessary for any bleeding to cease spontaneously. The excavation is begun on the outer and posterior (upper) surface of the external semicircular canal and is extended backward and downward, this trough is slowly deepened until the lumen of the canal can be seen through the transparent floor of the trough as a bluish gray line. The walls of the trough are then widened to the width of the canal down to the endosteum. Then the bony walls of the fenestra are burnished with a 24-carat gold burnishing burr. Before completion of the fenestra by opening of the perilymphatic space, the tympanomeatal membrane is freed from its remaining attachments to the antero-superior and postero-inferior canal walls, and a final revision of the bony cavity is made, in order that the completed fistula can be covered immediately with this membrane. The endosteum is then carefully pulverized with a polishing burr along the posterior (superior) and concave surfaces of the canal rather than on the convex surface. This decreases the danger of injury to the membranous labyrinth which would defeat the object of the operation.

The size of the fenestra is an opening into the perilymphatic space measuring from 3 to 7 mm by 1.5 mm.

All particles of bone dust are carefully removed to decrease the possibility of osteogenesis.

The tympanomeatal membrane, which is attached only to the remaining anterior and inferior portions of the sulcus tympanicus, is now swung backward and upward so that the fenestra is covered by Shrapnell's membrane and the adjacent part of the membrana tensa. The remainder of this membrane seals off the attic space, and the meatal portion lines part of the mastoid cavity. This is molded and held in position by the pressure of paraffin mesh filling the bony cavity.

A routine mastoid dressing is then applied. The first complete dressing, with gentle removal of the paraffin mesh, is done on the eighth day, great care being exercised not to disturb the flap. The wound is then dressed every other day until epidermization of the cavity is complete. This operation in reality extends the tympanic cavity backward so as to include the fenestra within that space.

Lempert reports (7) that he has performed this operation in 120 cases in the last two years with the restoration of practical physiological hearing in 69 cases. Ten cases showed audiometric improvement but not sufficient for practical hearing. Further impairment occurred in 14 cases. The hearing remained unimproved in 27 cases. The tinnitus disappeared in the 79 cases in which hearing was improved, remained unchanged in the 27 cases without improvement, and increased in the 14 cases in which further impairment of hearing occurred.



Fig. 7

Fig. 7 The illustration shows the incision for final liberation of the mastoid portion of the tympanomastoid membrane.

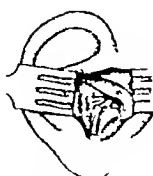


Fig. 8

Fig. 8. The illustration shows the fenestra created in the external semicircular canal.



Fig. 9

Fig. 9 The illustration shows the tympanomastoid membrane covering the reconstructed tympanic cavity and the fenestra in the external semicircular canal.

(Courtesy of Dr. Lempert and of the Archives of Otolaryngology.)

The fenestra remained open in 100 cases, although the hearing was improved in only 79.

Lempert made 38 revisions of the fenestra in 31 cases in which hearing diminished and the fistula test became negative.

He gives detailed operative findings and audiometric studies of these cases (7).

Osteogenesis is the predominating cause of closure of the fenestra, although sometimes the closure may be due to fibrosis. Osteogenesis may sometimes only partially close the fenestra.

Revision should not be attempted until from four to six months have elapsed after closure of the fenestra. Revision of the fenestra involves a much greater risk of injury to the membranous labyrinth than the original operation because the endosteal bony lid was always found attached to the membranous labyrinth.

(In deference to Wittmark's theory that otosclerosis is due to a perilyabyrinthine venous stasis, Lempert has, in some cases, elevated the drum over the epitympanic space to relieve this stasis.)

OSTEOGENESIS

That the establishment of an artificial opening in the labyrinth as a substitute for the non-functioning oval window results in an immediate and marked improvement in hearing in cases of otosclerotic deafness is a generally accepted fact. That this improvement is all too often lost by closure of the fistula or fenestra by osteogenesis is evident in a careful study of reported cases. While this osteogenic closure has been lessened in frequency by improvements in operative technique, Helsingren and some others believe that the

ultimate solution of this problem will be found in the experimental laboratory rather than on the operating table. The report of Nager, however, on Helsingren's experiments on monkeys indicates that only a start has been made in this direction.

Soundlike a statement that repeated fistulization will exhaust the regenerative power of bone is certainly open to question.

Canfield (2) reports that in experiment on the cat, skull defects made with sharp instrument and re-covered with the perosteum showed bone regeneration taking place in two weeks, but in defects made with the dental polishing burr (as used by Lempert) regeneration had not occurred after the same period of time. He concluded that the essential factor in maintaining a permanent fistula lies in the manner of making the fistula rather than in the tissue placed over the defect.

Lempert (7) however points out that because of the short period of time (two weeks) covered by these experiments, the only deduction that can be drawn is that the use of the dental polishing burr retards the power of bone regeneration.

Lempert, as a result of his study of the cases he has operated on, believes that, in addition to the retarding effect on bone regeneration of the polishing burr and the impregnation of the cut surface of the bone with gold, the character of the tissue used to cover the defect is also an important factor. In his revision of cases he found that in none of the cases in which bone regeneration occurred had he succeeded in covering the fenestra with Shrapnell's membrane (an epithelialized surface in contact with the labyrinthine opening), but that the perosteal-lined flap of the mastoid

portion was found strongly adherent to the fenestra. In none of the cases in which Shrapnell's membrane had been successfully applied to the fenestra did he find it adherent to bony walls of that opening. (Whether these two factors actually inhibit osteogenesis or only further postpone that process, will require longer observation before a positive conclusion can be reached.)

Because of his observations and because the fistula he now makes (up to 7 mm in length) cannot be covered entirely with Shrapnell's membrane, he now places a Thiersch skin graft on the periosteal surface of the meatal portion of the flap so that an epithelized surface covers the entire fenestra. Sufficient time has not yet elapsed to permit of any definite conclusions as to the efficacy of this procedure.

At first, reports of this procedure were received quite critically by otologists in general, chiefly because of vague indications in the selection of cases for the operation, the failure to utilize the audiometer in testing the hearing (pre-operatively and postoperatively), and the short period of time which had elapsed since operation in some of the cases reported. However, these criticisms carry less weight at the present time because of the greater care exercised in the preliminary study of prospective cases and the careful audiometric studies submitted. For example Holmgren, who reported in his first series of 35 patients, "They had such diminished hearing that they were unable to pursue their vocations," now uses the whisper test and the spoken-voice test with the untested ear, "masked" by a Barany noise apparatus. (These tests are made both in a silent chamber and in an ordinary examination room by more than one examiner.) He also tests with tuning forks, both by air and bone conduction. He states, "The variations in the results of examination are striking and significant."

He now believes, "The best method of obtaining objective and commensurable values is to make use of an audiometer. Hearing results following operations for otosclerosis, recorded only by whispering and conversational distance, are not reliable, provided the differences and distances are not very great."

"An audiometric examination before and after operation might demonstrate whether any real improvement whatsoever had occurred."

He stresses the necessity of absence of catarrh and middle-ear infections.

Sourdille's requirements are

Otosclerotic deafness with hearing between 50 cm of whispered voice and 50 cm of shouted voice with the opposite ear masked

Large and straight auditory canal. Normal drumhead with absence of any evidence of middle-ear inflammation, past or present. Stereoscopic radiograms.

Patients should be between the ages of eighteen and fifty-five and in good general health.

Lempert's (7) indications for fenestration now are as follows:

1 When the loss of hearing is bilateral and progressive.

2 When the stapes is fixed within the fenestra ovalis but the membrane of the round window has remained normal.

3 When the hearing by air conduction in the conversational frequencies, 512, 1024, 2048, has declined to a level which makes practical hearing of conversation impossible, while the hearing by bone conduction at these frequencies, as determined audiometrically with the opposite ear masked, has remained normal or has declined to a level not lower than 30 decibels. (Bone conduction is the index of cochlear nerve function.)

4 When the tympanic membrane is normal and completely intact.

5 When there is complete absence of infection in the middle ear.

6 When the lining of the bony walls of the external auditory canal is intact and healthy.

7 When the eustachian tube is patent.

8 When the patient is in a normal state of health.

The following hearing tests are made several times, at different intervals, before operation:

1 Audiometric testing (with a 6-A Western Electric Audiometer) of air and bone conduction with masking of the opposite ear.

2 Tuning-fork tests for both air and bone conduction.

3 Testing by means of normal conversation and whisper.

Further advances may be looked for along three lines:

1 *The selection of cases.* Otosclerosis is a disease about which little is still known as to its etiology and progress, and in which often the diagnosis cannot be made positively. The development of vacuum-tube hearing aids has greatly increased the field for these devices and probably will have a tendency to limit the selection of cases for fistulization to the patients who are still unable to obtain serviceable hearing by artificial aids, or who for some psychological or occupational reason may find the surgical method preferable. As more knowledge along these lines becomes available, the selection of proper cases will become more accurate, and the exclusion of

unsuitable cases more certain. The information obtained by the further study of cases already operated on, as more time elapses, will also undoubtedly give added help along these lines.

2. *The study of osteogenesis.* Because nearly all the failures reported have been due to closure of the fistula by new bone formation, study of this problem in the laboratory is of the greatest importance. If some method to prevent bone regeneration in the fistula, which can be used clinically, can be discovered, the field of this procedure will be greatly extended, and probably the operative technique can be made less complicated.

3. *The simplification of operative technique.* While undoubtedly as time goes on, the technique will be simplified, at present the operation is exceedingly delicate and difficult. The detachment, intact, of the flap consisting of the membranous auditory canal and the drumhead, and the amputation of the head of the malleus without injury to the drumhead or disturbance of the incus is a task requiring the greatest skill and delicacy. After the mastoid antrum has been opened and the horizontal canal exposed, the creation of a window in that dense, bony structure and the opening of the perilymphatic space without injury to the membranous canal, which must be done under a magnifying lens, is a task which taxes to the utmost the talents of the most skillful aural surgeon, even though he has had the most painstaking instruction, and practice on the cadaver. (Lempert's operation may require from three to seven hours for its completion.)

Lempert stresses the fact that because these two procedures are fundamental factors, they cannot be developed into an operation for use by otologists in general, but will necessarily be limited to those few who are willing to devote the time and labor necessary to develop the delicate skill and finesse necessary for their successful performance.

It is a tribute to the skill of these men to note the fact that none of them has had a death from any intracranial complication, in the many cases in which they have performed fistulization of the labyrinth.

While many still feel that the operation is in the investigative stage, the gradual improvement in the results reported by these men and their associates justifies the feeling that there is being evolved along these lines an operative procedure which will restore practical hearing to many patients affected with otosclerotic deafness, for whom no treatment heretofore has been in any degree effective.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Naylor-Strong, C. Some Considerations of the Pathology and Treatment of Suppurations Around the Angle of the Mandible *Proc Roy Soc Med*, Lond, 1940, 33 693

The author divides acute inflammations in the region of the angle of the mandible into three groups
1 Those caused by infection about partially erupted teeth

2 Postoperative infections

3 Infection following injection of local anesthesia

He indicates there are two general types of progress. In the first type the infection remains generally over the outer surface of the mandible, with early trismus and a swelling which remains a long time, and is followed by exfoliation of sequestra. In this type conservative treatment is advised and resolution is the rule.

In the second type the infection is principally on the inner surface of the mandible, and extends along the facial planes, this results in difficulty in swallowing and in speech. The patient becomes ill more rapidly and requires more rapid surgical treatment to avoid serious complications. A general anesthetic is administered, usually by nasal tube, and the throat is packed. The table is tilted so that the head is raised, and incision is made, usually pus is discovered and a rubber-tube drain is used.

Several cases of both types of infection are cited

CHARLES W. FREEMAN, D.D.S.

Padgett, E. C. Osteomyelitis of the Jaws *Surgery*, 1940, 8 821

The author presents a study of 59 cases of "frank" osteomyelitis of the jaws, exclusive of those secondary to fracture. A maxim drawn from the study of cases of osteomyelitis of the jaws due to pyogenic infection is that treatment should be conservative during the early stages, but fairly thorough and somewhat radical after sequestration has been effected.

This condition occurred in practically all ages. Males were more frequently afflicted, and involvement of the lower jaws was more common. Periodontal infection was associated in about one-third of the cases. Extraction of a tooth during an acute pulpitis or periodontal infection led to osteomyelitis in 11 cases. Trauma to the jaw in the region of the tooth initiated the infection in 5 patients. In 29 patients the condition resulted from other causes. These included blood-borne infection, syphilis, excessive irradiation, noma, trauma to the cheek, leucemia, and infection of the maxillary sinus.

It has previously been demonstrated that streptococcus hemolyticus is the most common organism associated with periodontal infection, and that staphylococcal and mixed infections occur less commonly. When the infection is blood-borne, the staphylococcus aureus is frequently found.

The pathology of osteomyelitis of the lower jaw is influenced by two factors: (1) the presence of dental elements, and (2) a unique blood supply. In the upper jaw two additional factors modify the changes: (1) the fact that the bone is of membranous origin, and (2) the presence of the maxillary sinus.

As the products of inflammation accumulate under tension, the vessels within the bone spaces become thrombosed. The pus follows the path of least resistance through the bony cortex, eventually perforates the cortex, and elevates and then ruptures the periosteum. This results in the separation of dead bone and the formation of a sequestrum which is usually complete in two or three months. As long as dead bone is present the opening in the periosteum will persist, and pus and debris will drain. The maxilla, however, is a membranous bone and therefore lays down little or no new bone. If the cementum of the tooth and the periodontal membrane are disrupted, the cementum remains as a foreign body. Unerupted teeth may similarly become foreign bodies if their blood supply is destroyed. If a wide area of periosteum is stripped from the bone and the central blood supply is blocked, complete necrosis of the bone may occur.

The local symptoms usually consist of a severe, aching, throbbing, deep-seated pain, with local tenderness, swelling, and, eventually, fluctuation. With rupture of the periosteum relief may ensue. Extension of the pus from the lower jaw may then occur into the submaxillary region, upper neck region, or region of the anterior pillars. Trismus may be marked. The systemic symptoms may be severe.

A few cases may show gradual bone absorption without actual sequestration. In infants the condition results from a septicemia and the organisms may be particularly virulent. Extensive damage to the tooth beds in children may cause marked interference with growth of the jaw and lead to serious deformity.

The outstanding features of irradiation necrosis are the chronicity of the course, the continued pain, the slowness of sequestration, lack of tendency for either the bone or the surrounding soft tissues to show any of the ordinary tendencies of normal tissues toward healing, and, finally, the lack of resistance to secondary infection.

In children it is sometimes difficult to determine if one is dealing with temporomandibular arthritis or osteomyelitis, and about the only distinguishing feature is the fact that the point of maximum tenderness is lower in osteomyelitis.

The roentgenograms usually show some early softening of the bone and in six or seven weeks heavy moth eaten, uneven outline between the edges of the live and dead bone becomes evident. Later, the sequestrum loses some of its density. Repeated roentgenograms over a period of from six to nine months may be necessary in order to be sure there is sufficient new bone to avoid jeopardizing the contour of the lower face when the sequestrum is removed.

Whether or not one should extract a tooth during the acute stage of periodontal infection depends upon the amount of trauma inflicted in removal of the tooth as well as the virulence of the infection and resistance of the patient. If the infection does not have the clinical signs of great virulence, early extraction with little trauma is generally beneficial, but if considerable trauma must be inflicted the reverse is true. The situation is analogous to doing radical surgery in the course of acute osteomyelitis of long bone. The fact that the streptococcus hemolyticus is the usual infecting organism should make one conservative when in doubt as to the method of treatment.

After the development of true osteomyelitis, the author treats the patient conservatively during the cut phase, and drains the soft tissues when localization is apparent. If internal drainage seems inadequate, submandibular drainage is used. When sequestration is complete the sinus tract is followed and opened, the dead bone is removed, overhanging edges of bone are excised, and the wound is loosely packed with iodoform gauze.

Thirty four patients with pure pyogenic osteomyelitis were cured after one operation; 3 had more than one sequestrectomy. None of these patients died. Three others with associated leucemia, and with radiation necrosis, died.

The author reports cases of chronic progressive osteomyelitis of the maxilla, the base of the skull, and the frontal bones, which followed antral infection and trauma. Each case had a progressive course leading to death from meningitis in about eighteen months.

JOHN A. GERS, M.D.

EAR

Brunner H. Disturbances of the Function of the Ear After Concussion of the Brain. *Laryngoscope* 54:5, 531.

Brunner deals only with concussion of the brain and the affections of the ear after concussion of the brain. Broadly speaking, all of these injuries are caused by some blunt force which has a wide point of impact against the skull. Either the skull is struck, blown or it is set into rapid motion by fall and suddenly comes to rest against some broad,

solid substance. Although there is no uniformity of opinions concerning the physiological changes in concussion of the brain, recent studies support the theory that derangement of the cerebral circulation is responsible for many of the sequelae. These sequelae can be detected microscopically by cephalography, by clinical examination, and by otological examination.

Microscopic examination reveals hemorrhages of the meninges which lead to thickening of the meninges and an obliteration of the meningeal spaces and, consequently, to a disturbance of the circulation of the spinal fluid. Further there are numerous dot-like hemorrhages foci of crushing and fiber and systemic degeneration in various parts of the brain and spinal cord. Degenerative changes occur in the nuclei of the cochlear and vestibular nerves. Encephalographic examination emphasizes the following points: (1) there are cases with definite concussions of the brain associated with normal encephalogram, (2) definite hysterical constitution may be combined with pathological encephalogram, (3) there are cases with pathological encephalogram but without any complaints.

After concussion of the brain, syndrome can be observed which consists of headache, dizziness, inordinate fatigue on effort, intolerance to toxicants, vasomotor instability, blurring of vision, emotional instability, psychological depression, peripheral irritability and diminution of the abilities to remember and to concentrate. This syndrome is organic, due to the microscopic and encephalographic changes of the brain, although psychogenic factors very frequently complicate the clinical picture if the socio-economic and other difficulties following the trauma last long enough.

In many instances it is difficult to distinguish between concussion of the inner ear and a longitudinal fracture of the temporal bone. There is less difficulty in distinguishing between a plain post-concussion syndrome which is a disease of the brain alone and postconcussion syndrome combined with disease of the temporal bone. In the latter there generally is definite impairment of hearing in the postconcussion syndrome; there is, as a rule, no definite impairment of hearing. Generally the plain postconcussion syndrome does not include marked cochlear symptoms.

In using the clinical rather than the psychological approach to vertigo, Brunner separates from the general term "vertigo" a specific sensation called "labyrinthine vertigo." The latter implies blinding or tactile type. If considers the labyrinthine vertigo as an otological symptom and as the most important otological symptom as far as the postconcussion syndrome is concerned. In differentiating between labyrinthine vertigo and non-labyrinthine vertigo the following objective symptoms prove the existence of even slight labyrinthine vertigo: the finding of spontaneous nystagmus, the finding of nystagmus after quick head movements, and the findings by means of the labyrinthine tests.

The postconcussion syndrome complicated by fractures of the temporal bone is much more serious than a plain postconcussion syndrome. The symptoms of the postconcussion syndrome are sublimated by the symptoms of the fracture. In the postconcussion syndrome complicated by concussion of the inner ear, the symptoms of the concussion of the inner ear predominate. NOAH D FABRICANT, M D

NOSE AND SINUSES

Kramer, R, and Som, M L. Intracranial Pathways of Infection from Diseases of the Sphenoid and Ethmoid Sinuses. *Arch Otolaryngol*, 1940, 32 744

Numerous textbooks and special articles have tabulated various pathways and modes of intracranial involvement from sphenoid and ethmoid infections. With the exception of a few instances, no proof has ever been offered to substantiate the existence of the assumed pathways. Kramer and Som have been able to demonstrate the source of infection in cases of bacterial meningitis of so-called undermined origin. Even after a complete post-mortem examination at the Mount Sinai Hospital the source of the infection had in many instances remained unknown until serial sections of the sinuses revealed the primary infection. The authors stress this point because they have found that paranasal sinusitis may be the origin of intracranial complications even if gross examination reveals no abnormality. Macroscopic evidences of an infection were observed in but 3 of 50 sinus blocks studied.

A frequent finding in cases of meningitis resulting from inflammation of the sphenoid and ethmoid sinuses is the primary submucosal abscess. Although obvious microscopically, such abscesses are difficult to recognize at operation or post-mortem examination. Because the authors have encountered them so often they believe that at operation it would be advisable to strip the mucosa of the sphenoid sinus in cases of meningeal irritation. It would appear that this is a more logical procedure than only the institution of adequate drainage. Spread to the meninges occurs by way of osteomyelitis and osteitis, through the perineural olfactory lymph sheaths, by lymphatic extension through perivascular lymph channels, through vascular spread by venous channels, by direct invasion of the meninges through congenital bony defects, and from a persistent cranial pharyngeal pouch.

NOAH D FABRICANT, M D

PHARYNX

Vivoli, D, and Bertelli, J A. A Contribution to the Study of Tuberculosis of the Tonsils (Contribución al estudio de la tuberculosis amigdalina). *An de la cátedra de patol y clin de la tuberculosis*, 1940, 2 193

The authors state that primary tuberculosis of the tonsils is rare and that its frequency of occurrence has been estimated at from 1 to 15 per cent. The

tentative diagnosis is based on the familial antecedents, the milieu, and some personal signs of the patient, among which may be mentioned the general aspect, pallor of the soft palate, cervical adenopathy of stationary type, prolonged suppuration of the ear, involvement of the larynx, sarcoids, erythema nodosum, and recurrent angina. Swollen cervical lymph nodes, which are located preferably under the mandibular angle and are resistant to any treatment, are considered as a constant and important sign of tuberculosis of the corresponding tonsil, especially if there is no localization in the lungs. Histological examination is the only means of establishing a sure diagnosis, and serial sectioning of the tonsil is imperative. The mere presence of tubercle bacilli cannot be accepted as confirmation of the diagnosis, because at times the bacteria are located in the crypts without causing any reaction, or they may have been carried accidentally into the tissue by the microtome, typical lesions must be found, such as Koester's follicles and giant cells.

The tonsils may be infected secondarily by the sputum in patients with open pulmonary lesions and by the circulatory route. Histologically, the presence of giant-cell follicles in the vicinity of the small vessels located in the depth of the tissue militates in favor of a hematogenous infection, while their presence in the vicinity of the crypts favors an exogenous origin.

From the clinical point of view, tuberculosis of the tonsils is divided into larval and frank forms. The larval forms include simple hypertrophy, tonsillar adenitis which is a form of subacute hypertrophic tonsillitis, and cryptal tonsillitis which is the most frequent manifestation of tonsillar tuberculosis. The frank forms consist of acute tuberculosis, chronic ulcerating and ulcerocaseating tuberculosis, which is the most frequent form, and lupus. Five cases are described.

The authors have made a histological study of 80 excised tonsils in an attempt to form an opinion on various points on which there is marked disagreement in the literature. For instance, the frequency of occurrence of larval tuberculosis has been variously estimated at from 1 to 12.75 per cent of all extripated tonsils in subjects considered as being clinically healthy. In the authors' series, all individuals who were operated upon presented acute tonsillitis, non specific hypertrophy, or signs of ordinary tonsillar infection. There were 20 undoubtedly tuberculous patients in whom the superficial examination of the tonsils did not cause any suspicion of the nature of their contents, tuberculous lesions were found in 3 tonsils, and showed that 15 per cent were larval forms. The remaining 60 tonsils were obtained from non-tuberculous subjects who lived with or were directly related to tuberculous patients and some of whom presented slight adenopathy of the mandibular angle, probably because of the tonsillar focus of the infection, no sign of tuberculosis was found in any of these tonsils. On the other hand,

histological examination in patients who did not belong to the former series and were suspected of having diphtheria showed that the ingina was of tuberculous nature.

It is generally admitted that tuberculosis of the tonsils occurs between the ages of twenty and forty years however the tonsils of the only tuberculous child whom the authors have been able to study still now contained typical tuberculous lesions. They think that histological examination should be made of all tonsils removed from patients who have large adenopathies.

RACHEL KRECI, M.D.

Martin, H. E., and Blady, J. V. Cancer of the Nasopharynx. *Arch. Otolaryng.* vol. 940, 3, 602.

Cancer of the nasopharynx includes all malignant growths arising on the walls of this cavity. Cancer in this area occurs most often on the posterior wall, the region of the nasopharyngeal tonsil, with its lateral extensions into the recessus pharyngeus, and next in frequency on the lateral walls, on the ridge which surrounds the orifice of the eustachian tube. Occasionally a growth may originate somewhat lower on the posterior wall, near the junction of the nasal and oral pharynxes. The floor of the nasopharynx and the anterior wall practically never give rise to cancer.

In the series of 87 cases reported, 84 per cent of the growths were some form of epidermoid cancer with malignant tumors of the salivary glands comprising 3 per cent. Fifty-six of the epidermoid cancers are transitional-cell carcinomas or lympho-epitheliomas. Highly differentiated squamous-cell carcinomas and spindle-cell carcinomas made up 13 per cent. Within the past year histologically unusual neoplasms of the nasopharynx have been seen at the Memorial Hospital, Philadelphia, one a myxosarcoma, and the other a neurochoroid tumor.

Cancer of the nasopharynx makes up about per cent of all malignant growths of the head and neck. Because of the absence in many cases of early local symptoms the nasopharynx diagnosis is frequently delayed or missed entirely. The disease is characterized by early metastasis to the cervical lymph nodes and extension to the cranium and to the orbit. The surgical inaccessibility of the primary lesion and its high radiosensitivity make irradiation the treatment of choice and a combination of external and intracavitary irradiation gives the best results. Cervical metastases from this rapidly growing highly malignant tumor also are best treated by radiation.

N. OR D. FABRICA, M.D.

NECK

Clow, L. H. Cancer of the Larynx; An Analysis of 250 Operative Cases. *Arch. Otolaryng.* vol. 940, 3, 434.

This report is based on experience with 50 cases of cancer of the larynx treated by laryngofissure or laryngectomy. The youngest patient is a woman twenty-one years old. The oldest patient

treated by laryngofissure is a seventy-eight year old age and the oldest laryngectomized patient was seventy-seven years old. Although impressions commonly are misleading, the author has long been impressed with the idea that there is a hereditary tendency in cancer. There is a history of cancer occurring within 3 generations in 41 instances. Excessive use or abuse of the larynx probably is predisposing factor. The occupation of 50 patients accumulated excessive use of the larynx.

End-results of surgical treatment of cancer of the larynx are influenced by the extent of involvement, the location of the growth, and the degree of malignancy.

True cordal cancer should be treated by laryngofissure. Cancer limited to the anterior commissure may be successfully treated by laryngofissure if a large segment of the overlying thyroid cartilage is removed. Laryngectomy gives better results than laryngofissure in cases of subglottic cancer.

Employment of local anesthesia, prevention of the inspiration of blood into the tracheobronchial tree during operation, and prompt aspiration of secretions from the trachea after operation will decrease the incidence of postoperative pulmonary complications.

JOSEPH K. NARA, M.D.

Martin, H. E. Selection of Treatment for Cancer of the Larynx. *Ann. Otol. Rhinol. & Laryngol.* vol. 49, 752.

In selecting the treatment for an individual case of cancer of the larynx, radiation and surgery the two accepted methods, are often considered only from their competitive standpoint. In other words, one or the other is advocated by its proponents as offering complete solution to the problem of laryngeal cancer. The author set out to point out the fallacy of such partisan concept, to discuss the unique merits and limitations of both methods, to show that each is indicated in particular form of laryngeal cancer and that in some cases combination of the two is superior to either method used alone.

The treatment of laryngeal cancer by any method is accompanied by definite hazards and is justified in the absence of histological proof of the presence of cancer. In every case therefore biopsy is prerequisite to the selection of treatment method.

This discussion is based upon the premises that (1) cancer of the intrinsic larynx is mainly a surgical problem and usually is treated by radiation therapy, and (2) cancer of the extrinsic larynx is mainly a radiation problem practically all cases being inoperable at the time of the first examination.

Cancer of the intrinsic larynx or vocal cords is, for the most part, well differentiated squamous carcinoma of Grade I or II, which thus usually grows slowly rarely metastasizes, and is highly radioresistant. Such growths fulfill most of the conditions in which surgery that is, the disease may be diagnosed early direct extension is limited for considerable time by the barrier of the cartilages.

box of the larynx, and the lesions may be removed surgically with a safely wide margin by either partial or total laryngectomy, the latter depending upon the local extent of the growth. On the other hand, cancer lethal radiation for these highly radioresistant growths, centered directly on the vocal cords, is attended by a number of serious sequelae, including persistent lymphedema of the glottis and late radionecrosis involving the cartilages. This does not imply that these growths can never be cured by radiation, but rather that surgery will produce far more cures with fewer dangerous complications. The argument that radiation is preferable because it preserves the vocal cords intact is hardly adequate, since the loss of the speaking voice is not too high a price to pay for the additional security.

In cancer of the extrinsic larynx these conditions are reversed. Malignant tumors of the epiglottis, the aryepiglottic folds, and the arytenoids, are mainly highly malignant, poorly differentiated epidermoid carcinomas or lympho epitheliomas. They grow rapidly, and metastasize early and often bilaterally. Unlike intrinsic cancer, these extrinsic growths are often highly radiosensitive.

Referring again to the surgical treatment of cancer of the intrinsic larynx, there are two accepted procedures: (1) partial laryngectomy—often referred to as laryngofissure or hemilaryngectomy—and (2) total laryngectomy. In small growths limited to the anterior two thirds of one cord, not invading the anterior commissure nor extending back of the vocal tubercle, partial laryngectomy should be advised. If the lesion extends across the anterior commissure onto the opposite cord with only moderate vertical extensions above and below the glottis, the patient is definitely happier with the lesser operation since he

can at least force some air into the hypopharynx and produce audible speech. For more advanced cancer of the intrinsic larynx, total laryngectomy is necessary.

Not all advanced cases are incurable simply because they are inoperable. Treatment may be given by a permanent laryngostomy with the implantation of radon seeds. This method requires the use of a special instrument or laryngostat to maintain the patency of the laryngostomy opening. Such a combination of surgery and radiation has been successful in the author's clinic in about 50 per cent of the selected cases in which it has been used.

In all cases, careful examination should be made before operation for enlargement of any cervical nodes. The author does not believe that total laryngectomy can be combined safely with neck dissection at the same operation.

For cancer of the extrinsic larynx, there can be little question that radiation is the method of choice, since this growth can seldom be removed with a safely wide margin by the standard forms of total laryngectomy. Lateral pharyngotomy, as recently popularized by Trotter, is a technically feasible operation, and furnishes only a means of approach to the pharynx, but provides no method of excising an inoperable growth in this region. It must be recognized, however, that surgery has a definite part in radiation therapy. In some cases radiation may increase the local swelling so that tracheotomy is necessary. In others, the growth itself or the radiation reaction may produce sufficient obstruction in the pyriform sinuses so that sufficient nourishment cannot be obtained, and nasal tube feeding or even gastrostomy may be required.

JOSEPH K. NARAT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Ray, B. S., and Wolff, H. G. *Experimental Studies on Headache: Pain-Sensitive Structures of the Head and Their Significance in Headache.* *Arch. Surg.* 940, 4: 3-5.

Using 30 patients carefully selected from a much larger group, the authors made studies on the sensitivity of various structures about the head by means of direct stimulation. These structures included the scalp, bones of the skull, dura mater and brain, as well as the contained arteries, veins, and sinuses.

A great deal of interesting data is given which describes in detail the results of these stimulations and the local and referred pain which is produced. An insight is thus gained into the possible mechanism of certain types of headache.

All of the five layers of the scalp and the contained arteries are sensitive to pain. The basilar dura, the dural arteries, the dural venous sinuses, and the basilar cerebral arteries are all sensitive to pain. The bones of the skull (including the emissary veins and diploic sinuses), the parenchyma of the brain, the ependyma and choroidal plexuses, and the greater part of the dura and pterionoid are not sensitive to pain.

When stimulation is applied to intracranial pain-sensitive structures on or above the superior surface of the tentorium cerebelli, pain could be produced in various areas in front of a line drawn across the top of the head from ear to ear. Intracranial pain-sensitive structures on or below the inferior surface of the tentorium are associated with painful sensations in various regions behind this line. In the first instance, the pain pathways are contained in the trigeminal nerve. In the latter the pathways for the painful impulses are chiefly in the glossopharyngeal, vagus, and upper three cervical nerves.

There are 6 basic mechanisms which seem to produce headache:

1. Traction on large cerebral veins and displacement of the dural venous sinuses
2. Traction on the middle meningeal artery
3. Traction on the large basilar arteries
4. Distortion or dilatation of any artery in or about the head
5. Inflammation involving or situated near any of the pain-sensitive structures of the head which have been named
6. Direct pressure of tumor on cranial or cervical nerves containing pain-bearing fibers from the head

Headache from intracranial disease is most often referred pain, but "local tenderness of the scalp

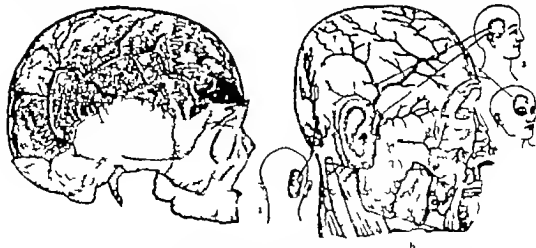
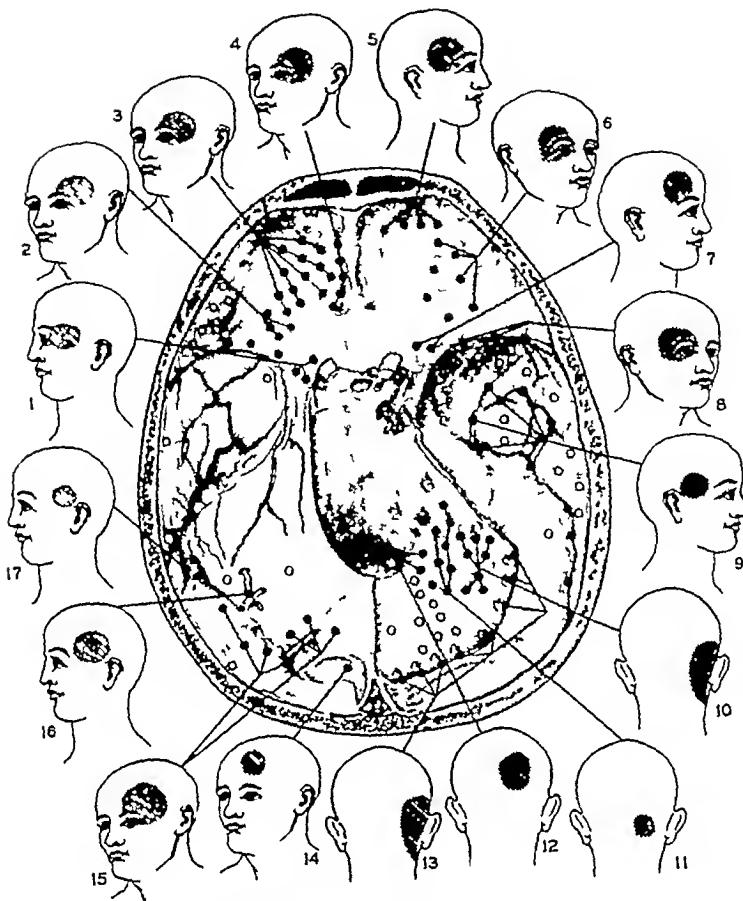


Fig. a, view of the diploic and emissary veins of the cranium. b, view of the arteries of the scalp. The diagrams show the area of pain following stimulation of () the occipital arteries, () the supra-orbital and frontal arteries, and () the superficial temporal artery.



○ indicates the point of stimulation without pain
● indicates the point of stimulation causing pain

Fig 2 View of the dural floor of the skull, the tentorium cerebelli and the adjacent venous sinuses and venous tributaries. The diagrams show the area of pain following stimulation of (1 to 8) the dura of the floor of the anterior fossa, (9 and 17) the middle meningeal artery, (10 to 12) the dura of the floor of the posterior fossa, (13) the inferior wall of the transverse sinus, (14) the superior wall of the torcular Herophili, (15) the superior wall of the transverse sinus and upper surface of the tentorium cerebelli, and (16) the inferior cerebral veins

may serve as an index to the structures responsible when a lesion produces direct irritation of pain sensitive structures" JOHN MARTIN, M D

Horrax, G A Proposal for the More Radical Treatment of Gunshot Wounds of the Brain *Canadian M Ass J*, 1940, 43 320

Important technical adjuncts accruing to the neurosurgical field since the last war may lower the mortality of gunshot and shell wounds of the skull and brain. Two types of wounds are considered (1) the "gutter wound" in which the missile goes through the scalp and cuts a gutter in the skull, from which it is deflected, and in which case bone frag-

ments only are showered into the brain, and (2) the penetrating wound proper, in which the missile enters the skull and lodges in the brain together with the bone fragments that are usually carried along with it.

The treatment of these wounds in the last war, as developed especially by Cushing, is described. Electrosurgery and the use of strong suction apparatus permit neurosurgical operations of much greater magnitude than was possible during the last war. It is also evident that many brain areas can be wholly or partially removed without detriment to the individual. With these two facts in mind it is possible to visualize a much more thorough débridement of

brain wounds than that which was practiced during the first World War.

It would seem that the technique for the present treatment of gunshot wounds of the brain should be as follows:

Prophylaxis. Soldiers should go into action with short-cropped hair. Tetanus toxoid should be given prophylactically and if tetanus toxoid has not been given, tetanus antitoxin should be administered after wounding and again after subsequent operations.

Pre-operative preparation. The whole scalp should be shaved. High enuresis against the overlooking of small multiple wounds, and allow extension of operative incisions in a clean field if they are necessary. Stereoscopic roentgenograms should be made of the skull in all head wounds and neurological examinations should be made to correlate the objective findings with the area of known damage and as means of gauging the patient's progress.

Operative procedure. The preliminary part of the operation on penetrating brain wounds would include the usual careful debridement of the scalp, periosteum, and bone as carried out in the World War. By electrosurgical means the area of dorsal penetration should be excised. If outside of the hole in the dura so that an area of brain, of at least 3 cm. in each of its diameters, is exposed. The area may of necessity be much larger than this. Then in the normal brain tissue, the same type of debridement can be carried out on the track in the brain as is performed in the overlying tissues. This would be accomplished by the combination of electrosurgical excision around the track together with the use of strong suction. With the electric current constantly applied to the metal suction tube the soft brain surrounding the track, together with the contents of the track itself—clots, disorganized brain, hair, bone, and metal fragments—could be evacuated, while the uninvolved brain beyond the area excised could be kept free of contamination to a very large extent because of the heat of the metal tube. With the use of light retractors or flat spatulas, the debridement could be accomplished under direct vision and thus all the foreign matter secured. With suction sufficiently strong most of the bone fragments and the smaller metal fragments could probably be evacuated because of their adherence to the end of the suction tube. Through and through wounds debridement should be carried out from both the wound of entrance and the wound of exit.

It seems more than probable that a far better debridement of all brain wounds could be accomplished by the methods thus indicated than is ever possible with the older procedure, and probably in far less time. This would mean that more operations could be done, and that a greater proportion of the patients would survive as in most instances complications are found to have developed because of incomplete primary debridement.

JOHN L. LUDWIG, M.D.

Goblets, R. G. Cerebellar Subdural Hematoma in an Infant Two Weeks Old with Secondary Hydrocephalus. *Surgery* 940, 8, 771.

Subdural hematomas have received considerable attention recently. Good descriptions have been given of subdural hematomas over the hemispheres in infants, but the author describes a rare form of subdural hematoma occurring in an infant two weeks old. This particular infant had cerebellar subdural hematomas following intracranial hemorrhage in the posterior fossa. A case report is appended which is adequate and concise. The main point are follows:

There was gradual enlargement of the head, bulging of the fontanelles, and separation of the sutures. The child gradually became drowsy. There was no elevation of the optic discs, and no abnormalities of the reflexes were noted. The leucocyte count was 13,000. X-ray examination of the head revealed marked separation of the cranial sutures. The spinal fluid was grossly bloody in xanthochromic fluid. Daily spinal punctures were employed, and the fluid became light straw-colored. At this time bilateral subdural taps through the coronal sutures showed clear fluid on both sides. The ventricles were tapped and 60 c.c.m. of fluid were removed and replaced by air. The ventricular system showed symmetrical dilatation of the entire system. Under ether anesthesia, and through a small incision, the dura of the posterior fossa was exposed and a clot containing 30 c.c.m. of dark, rusty fluid was tapped immediately subjacent to it. The child made an uneventful recovery. ALBERT V. LUDWIG, M.D.

Robinson, H. Colloid Cyst of the Foramen of Monro Successfully Treated by Operation. (Citer also a similar operation Kollikow's for the Foramen Monro.) *Surgery* 940, 3, 32.

Robinson states that only about a colloid cyst of the foramen of Monro is found among from 250 to 300 tumors of the brain and that up till now about 50 operated cases have been reported, of which 75 per cent of the patients have survived the intervention. The diagnosis can be established only by means of encephalography. A case is described.

Since three months, a man aged thirty years had headaches which increased in severity and finally became localized in the back of his head. He kept his head immobilized and bent forward toward the left because he felt less pain in this position. He had also tickling sensation in the left half of the tongue and palate stitches in the left ear and temple, and, lastly double vision when looking to the left. He had vomiting and little desire to work he was forgetful and irritable. He offered resistance to passive movements of the head and his skull as generally painful to percussion. There was no limitation of the field of vision, but steady papilla of 2.5 D. The pupils were deformed, but reacted well. If had no paralysis of the muscles of the eyes, but minute facial paresis on the right. There were sensory or motor disturbances.

Roentgen examination showed the picture of an internal hydrocephalus which was caused by an obstruction in the third ventricle. Ventriculography was then undertaken. The two lateral ventricles were punctured at the same time and it was found that the pressure of the cerebrospinal fluid was high on both sides, 280 c cm of fluid were removed and replaced by air, and another roentgenogram was taken. The right ventricle was somewhat larger than the left and the sagittal exposure showed that the left third ventricle was only slightly filled. Several exposures were then taken and made it appear probable that the third ventricle was reduced in size by a tumor compressing it from above, 220 c cm of the removed fluid were reinjected and the operation was started with the cutting of a Dandy flap on the right side, under local anesthesia. The cerebral convolutions were found to be flattened. The right, enlarged lateral ventricle was opened with a small incision and a bluish cyst, having a gelatinous content, was discovered inside the foramen of Monro. It was possible to detach the wall of the cyst from the plexus without hemorrhage, the ventricle was then filled with saline solution. Paresis of the left leg and arm occurred which, however, regressed after some time. During the first days after the operation, there was excessive formation of cerebrospinal fluid which was removed every day by puncture, while dietary fluids were restricted. The patient was discharged as cured after six weeks. Headaches and stasis papilla had disappeared as well as the mental disturbances. Histological examination revealed an ependymal cyst lined with ciliated epithelium.

Opinions differ greatly on the origin of these cysts. Foerster thinks that in the midbrain, in which subependymal cysts are found during embryonic life, such colloid cysts may develop later, while Hochstetter considers them as remnants of the embryonic paraphysis. This concept is also defended by the American authors who therefore call these cysts "paraphyseal cysts." Their diagnosis is difficult and is only possible by means of ventriculography. The symptoms are caused by obstruction of the foramen of Monro. The best surgical access is obtained through the frontal lobe according to Dandy's method. Intervention should always be tried because of its relatively favorable prognosis.

(BRUENING) RICHARD KEMEL, M D

SPINAL CORD AND ITS COVERINGS

Munro, D. Care of the Back Following Spinal-Cord Injuries. *New England J Med*, 1940, 223 391

Provided the skin is primarily undamaged, bed and pressure sores develop only because of secondary destruction of local tissue. The occurrence and extent of this destruction depend on the presence of a bony weight-bearing prominence close beneath the skin, the thickness of the padding tissue between the bone and the skin, the length of time that the con-

stant weight-bearing is permitted over this point, and the integrity of the protective horny layer of the skin. To produce tissue destruction, local anoxia and anemia must be present in addition to these factors.

Local compression of the skin at first produces pallor, which is followed by a flare. A more prolonged reaction produces local tissue asphyxia which may be associated with wheals or blisters. This is a vasodilatation produced by an abnormal amount of local metabolic substances. In addition, prolonged pressure on the skin first causes pain, and then local anesthesia. This local reaction produces pressure sores. When in addition to the above local changes there is added failure of the autonomic vasomotor responses then bed sores are produced.

In an analysis of 12 cases of spinal cord and cauda-equina injuries Munro found that 24 per cent developed bed sores. Bed sores occurred in 54 per cent of 26 thoracolumbar cord injuries, and in 18 per cent of cervical and cauda-equina injuries.

The author's method of treatment of bed sores is as follows:

If the early signs of a pressure sore appear, the hyperemic areas are painted with tincture of benzoin twice in twenty-four hours. If the pressure sore develops into a bed sore or if the tissue destruction is merely the local type that goes with a pressure sore, the skin edge around the ulcers is treated in the same way. Sloughs and gangrenous tissues are never cut off but are allowed to stay in place until they fall off. Abscesses are tapped and emptied through the needle. Incision and drainage is contraindicated. Ulcerated areas that are infected with streptococcus hemolyticus are dressed with gauze saturated in a solution of sulfanilamide. Zinc peroxide should be used if the infection can be shown to be a micro-aerophilic hemolytic streptococcus. Other ulcerated surfaces are wiped clean twice in twenty-four hours. No local application is used. High vitamin and high protein diets, transfusions, adequate fluids, appropriate chemical treatment of the bacteriuria always present, and physiotherapy are adjunct measures.

In the past Munro has tried and discarded all the ordinary forms of local applications, including tannic acid, gentian violet, scarlet red, enzymol, strapping of the ulcer, all types of ring supports, Bradford frames, sawdust beds, and lamb's wool pads. He has also discarded all types of mattresses except the one of sponge-rubber which promises to be helpful.

In addition, it is essential that the bed be kept absolutely dry by applying tidal drainage, that all forms of splinting of the back, while the patient is bedridden, be avoided, and that the patients, especially those with thoracic injuries, be turned every hour, their backs being rubbed, dried, and powdered at each turning.

DAVID J. IMPASTATO, M D

De Leo, F. The Trophic Syndrome of Spina Bifida Occulta (Sindromi trofiche da spina bifida occulta). *Clin chir*, 1940, 16 385

The author regrets the fact that, as judged by reports in the literature, so little importance has

heretofore been attached to the possibility of trophic changes in the lower extremities in children with spina bifida occulta. Such changes may be the direct result of such a defect, which was commonly supposed to bear but little pathological significance. He cites the case histories of several patients whom he has observed and operated upon, and he illustrates their developmental defect by photographs and roentgenograms.

The defects which occur may be either unilateral or bilateral. One limb may be shorter than the other and various combinations of paralysis occur. All or several toes may be deformed by absent or grossly altered formation of the phalanges. Areas of complete sensory loss may cover several segments and chronic ulcers may be a frequent component of the clinical syndrome. Such changes, of course, are due to myelodysplasia, and gross microscopic changes in the spinal cord and its roots may be entirely out of keeping in their severity with the roentgen-ray evidence of the congenital defect.

Operation may reveal dense fibrous tract leading from the subcutaneous level deep into the bony defect, which may involve the cord in scar-like tissue. Abnormal ossification within the vertebral canal at the site of the posterior bony defect may be the basis for the neurological defects. Pseudo-tumor (fibrous ossified masses in the defective hiatus) or ectal meningocele with root contents may be disclosed (operation).

Operation can accomplish some semblance of restoration of the normal anatomy and freeing and replacement of any involved nervous structures. Physical therapy both before and after operation is valuable adjunct which should not be overlooked, and the care of trophic ulcer alone may be problem of major difficulty. *JOHN M. ARNOLD, M.D.*

PERIPHERAL NERVES

Doubroff, J. G. Wounds of Peripheral Nerves (Verletzungen peripherer Nerven). *Chirurgia Internationalis*, 1940, 4, 45.

There is no accord among the various statistics on the frequency of peripheral nerve injuries in war wounds. While most authors in their statistics include only severe injuries of peripheral nerves and then report frequency from 1 to 4 per cent, one can increase this figure to 10 per cent or more by considering the report of those authors who include the slightest nerve injuries. According to Fraumond, one must reckon the complete section of the nerve in 3.3 per cent of cases. For the following nerves the decreasing order of their frequency of involvement is the radial, median and ulnar sciatic, the brachial plexus, the peroneal nerve and, last, the tibial nerve. One must differentiate between direct nerve injuries occurring at the site of wound, and indirect injuries which develop as result of secondary pathological processes active in the vicinity of nerves. Moreover nerve injuries may occur as result of stretching, even when the nerves lie at

distance from the site of injury. One may divide traumatic nerve lesions into several types. There are those which develop as result of pressure and lead to mild or severe disturbances of nerve function, and become apparent externally through the development of so-called pseudoneuromas. Further there are those resulting from the exposure of nerve followed by scar tissue formation about the nerve which in turn causes nerve damage. Finally, there are direct injuries completely severing a nerve following which central and peripheral neurogenesis develop.

The management of nerve injuries does not stand in the last war demonstrated that 60 per cent can be cured while about 3 per cent of the cases show improvement under conservative treatment. About 1 per cent are not benefited by conservative therapy. Conservative therapy consists of wound treatment and immobilization of the extremity in suitable position. If evidence of paralysis persists, operation is indicated in the course of from 1 to 6 months. Nerve sutures should be performed under local anesthesia if possible, since more satisfactory orientation is possible and confusion between nerves and tendons is more easily avoided.

In primary nerve suture, which may be undertaken when complete severance of nerve occurs, all damaged fragments of the nerve should be removed since only then can good outcome be expected. Hemostasis in the region of the nerve suture is also very important, since the presence of hematoma of loose connective tissue proliferation which interrupts the growing nerve fibers. In order that nerve suture succeed there must not be the slightest tension. This condition can almost always be achieved through suitable fixation of the extremity. Nerve sutures should include only the epineurium. Sutures which touch the endoneurium lead to scar formation. For removal of neuromas sharp scalpel or razor never scissors, should be used.

A method of nerve suture described by Richter may be used to advantage. Graft is made of the epineurium of the central anastomosis and laid over the line of junction following the nerve suture. The outcome of secondary nerve suture depends on decidedly on the purpose of the treatment (massage or electrotherapy). If approximately 10 of the nerve ends not possible because of too large gap one may attempt homoplastic nerve transplantation, although the benefit is slight at most for irreparable paralysis suitable typical orthopedic operations and apparatus are indicated.

(B. HENRI) JOHN L. LANGE, M.D.

SYMPATHETIC NERVES

Splavitz, F. Three Cases of Thrombo-angiitis Obliterans Treated by Resection of the Sympathetic Nerves (Le traitement de la thrombo-angiite oblitérante par la résection des nerfs sympathiques). *Chirurgia Internationalis*, 1940, 4, 390.

It is pointed out that the distinct clinical entities may be encountered in which the caliber of the

arteries may be lessened those, as in Raynaud's disease, in which the mechanism is one of vaso motor fault, and those as in Burger's disease, in which thrombus formation obliterates the lumen of the vessel. The author has treated 3 cases of the latter category by resection of the splanchnic nerves and he gives a detailed case history in each instance.

Burger, Ghiron, and others have adhered to the theory that there is primarily a thrombus formation followed by an arterial lesion infectious in nature. Winiwarter, Vanzetti, and another group believe that the arterial lesion is primary and that the thrombus formation is secondary to it. In any event, it is conceded that exposure to cold, trauma, infectious disease, and tobacco predispose the individual to such arterial changes. Ghiron would divide the course of the disease into two stages: (1) the acute stage, when, during the incipency of the thrombus, there is a thickening and acute inflammatory process progressing in the vessel walls, with perivascular infiltration of leucocytes and connective tissue nodule formation in the vessel's lumen, and (2) the stage of organization of the thrombus, obliteration of the lumen, and a subsidence of the acute inflammatory process.

The operation of splanchnicectomy is based on the original observation of Oppel (and since accepted by others) that obliterating endarteritis is due to a hyperfunction of the adrenal gland and a superabundance of circulating adrenaline, in the presence of an actual infectious process in the vessel walls. Such an operation should theoretically gain what many another operation has attempted such as unilateral adrenalectomy, partial bilateral adrenalectomy, medullectomy, denervation of the adrenal glands, partial capsulectomy, and alcoholic infiltration of the splanchnic. The author's operation consists of a suprathoracic resection of the nerves

done through a lower posterior approach. Results depend upon early treatment, and surgery should be instituted without delay when a diagnosis is made. Amputation may eventually have to be done, but this is less likely to be true if splanchnicectomy is done before arterial changes have progressed too far.

JOHN MARTIN, M.D.

MISCELLANEOUS

Huber, P. Extirpation of the Stellate Ganglion (Extirpation des Ganglion stellatum) *Zentralbl. f. Chir.*, 1940, p. 1116.

Huber reports the bilateral removal of the cervical sympathetic ganglion in 7 patients. Complete success already persisting for four years was obtained in a patient aged sixty three years who had been suffering from Raynaud's disease, while a recurrence appeared after four months in another patient. In a case of obliterating endarteritis, it was possible only to avert the threatening gangrene, while the patient was found to be permeated with scar tissue and pigment.

Bilateral extirpation was undertaken in an attempt to improve the blood perfusion of the brain in a woman with bilateral cerebral embolism occurring after an extra uterine pregnancy, but no decided result can be noted as yet because the time elapsing since the operation is still too short. Intervention on the left side has been unsuccessful in a case of angina pectoris while removal of the right ganglion in a patient with neuroma of the right arm, resulting from a firearm injury, caused sudden freedom from pain, which has persisted for the past four months. The operation was performed according to the method of Rieder which has always fulfilled its purpose. (careful reconstruction of the tissues was always done.) (MAX BRUNN) RICHARD KIMMEL, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Atkins, H. J. M.: The Treatment of Chronic Mastitis; Definitions—Effects of Pregnancy Estrogens, Androgens, Diathermy—Summary and Conclusions. *Lancet* 1940, 39, 4

In 1937 clinic for the investigation and treatment of chronic mastitis was established at Guy Hospital, London, by Bishop and Atkins. This clinic has been attended by patients with pain or a lumpiness in the breast, or with both symptoms. Chronic mastitis was defined as pain or lumpiness of the breast not due to bacterial inflammation, new growth, or fibrocystoma. There are many individuals with periodic pain in the breast and lumpiness sufficient to distinguish the breast from the surrounding cutaneous tissue. I practice the use of the term chronic mastitis as confined to those cases in which the symptoms and findings are severe enough to warrant examination by a physician. The apprehensive individual with mild symptoms frequently as a patient, while the phlegmatic individual with the same condition could stay at home. Thus the mental status of the patient is considered in evaluating the treatment.

The substances used in the treatment of chronic mastitis are studied from the clinical, and, as regards estrogens and androgens, from the histological aspects. In all cases inert pills or injections are administered before actual treatment is started in order to eliminate the psychological factor. Thirty-one patients are relieved by means of inert materials. This included those in whom the psychological element predominated and those in whom spontaneous resolution occurred. These patients received further therapy. Six patients became pregnant. In 4, all symptoms disappeared between the fifth and sixth months, in 2 no relief occurred, and 2 failed to return for observation after ten weeks.

Estrogens in the form of estradiol benzoate were administered by injection, synthetic stilbestrol as administered by mouth. The patients are divided into 2 groups. In Group 1 the patients received less than 80 mgm. of estradiol benzoate in four weeks, or 350 mgm. of stilbestrol by mouth in eight weeks. There were 4 patients in this group. In 3 there were no changes, in 4 the condition became worse, and in 3 there was improvement. In Group 2 some patients received 80 mgm. of estradiol benzoate in four weeks, or 80 mgm. of stilbestrol in eight weeks while others received higher doses for longer periods. There were 9 patients in this group. In 7 there was no change, in 1 the condition became worse, and in 1 the pain was diminished but the lumpiness persisted. In 1 the condition became worse, and in 1 the changes were so extensive to warrant any consideration of surgery. In 1 the changes were so extensive to warrant any consideration of surgery.

series examined. However the impression is that estrogens cause an increase in fibroblastic activity especially of the subepithelial fibrous tissue. This corresponds to the clinical findings and suggests that abnormal activity of estrogens may be a factor in the cause of chronic mastitis.

Androgens are administered in the form of testosterone propionate. The patients are divided into 2 groups. I Group 1 the patient received less than 400 mgm. of testosterone in four weeks. There were 6 patients in this group. In 6 the condition improved, in 6 others there was no change and in 1 hair began to grow on the upper lip and the voice deepened, and amenorrhea developed. In Group 2 some of the patients received 400 mgm. of testosterone in four weeks, while some received higher doses or equivalent doses over longer periods. There were 11 patients in this group. Nine showed improvement in their condition, in 2 the condition became worse and in 1 it was unaffected. Some patients developed atrophy, a change in voice and amenorrhea. One patient developed cancer of the breast ten months later. Though local improvement occurred, undesirable associated effects also occurred. These symptoms persisted for nine months after treatment had been stopped. Masculinization tends to occur mostly in younger persons, and the average age of this group was 41 years. In 10 out of 11 instances a 40-year-old patient developed these symptoms after relatively small doses. One patient developed carcinoma, the only 1 in this group in three years. This is of interest in view of the suggestion that androgens may protect patients against carcinoma (Looser 1935). The histological changes in the breast produced by androgens is doses up to the limit of tolerance are insignificant. The theory is here that the administration of androgens is justifiable to present on experimental grounds alone and that they should not be prescribed therapeutically until their effects have been studied more carefully.

Diathermy as the method of treatment in 6 patients. Five were temporarily relieved of pain and of these returned because of the recurrence of symptoms. One patient failed to return for observation. Thus diathermy is of value in alleviating pain in chronic mastitis, but its value likely to be only

Atkins

James M.D.

Tumors of the mammary gland

(Geschwulste, 1940, 30)

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in the left breast (63.7 per cent). The benign tumors were included in the group of mixed epithelial tumors. There were four instances of pen-canalicular fibro-adenoma in the patients between the ages of twenty-five and forty years. In 5 patients the condition was localized to the nipple in the guise of benign warts. Even the benign tumors are to be removed in every instance, since they may become malignant. The proportion of malignant tumors of the male breast to those of the female breast is 0.83 per cent, therefore it is somewhat lower than the figures given in the literature (1 to 2 per cent). In 1 case a local recurrence developed at the spot where the tumorous changes had been located according to the anamnesis. The time periods in which the recurrences developed varied from five to fifteen months.

Benign tumors were removed under local anesthesia, while malignant tumors were removed under the usual general narcosis with radical removal of the entire breast gland, of the pectoral muscle, and of the axillary fatty tissues and the lymph glands. Following the operation roentgen irradiation is absolutely necessary. The experiences of the clinic show better end-results in the irradiated cases.

The histological picture varies from that of carcinoma in the female breast. The greatest number of carcinomas in the male are cylinder-epithelial adenocarcinomas. The prognosis is worse in the male than in the female, the explanation for this may be found partly in the indifference of the male toward breast changes, and partly in the anatomical structure of the gland. Of the 6 patients who died, only 2 survived the operation for two years, there was not a single instance of survival lasting from three to five years. (E. ILLÉS) JOHN W. BRENNAN, M.D.

TRACHEA, LUNGS, AND PLEURA

Zavod, W. A. Bronchospirography. Description of the Catheter and the Technique of Intubation. *J. Thoracic Surg.*, 1940, 10: 27.

The catheter (Fig. 1) used in bronchospirography is made of soft latex rubber, is boilable, 55 cm. long, and slightly opaque in its cross section, which measures 1.0 cm. by 1.2 cm. It has two channels measuring 4 mm. by 5 mm. each in cross section. One channel, the bronchial, extends over the entire length of the catheter, the other channel, the tracheal, is 9 cm. shorter. The bronchial channel has an inflatable rubber bag situated 0.5 cm. from its end, a capillary air lead opens into the bag. A larger bag with its respective capillary air lead is found around the entire catheter 1 cm. above the opening of the tracheal channel. The bronchial and tracheal bags can be inflated to diameters of 2.5 and 5 cm., respectively. The bronchial end of the catheter has 5 cm. of special flexible steel plate incorporated into its wall, this permits angulation of the catheter to correspond to the angle formed at the junction of the left bronchus and the trachea. The capillary air leads and the flexible steel plate are opaque to roentgen rays and are easily visualized under the

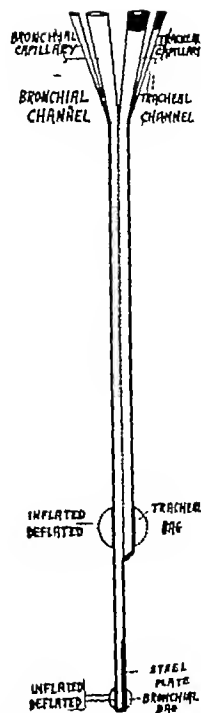


Fig. 1. Structural drawing of the bronchospirography catheter.

fluoroscope. The construction of the catheter, as described, permits graphic analysis of the function of each lung separately when the catheter is intubated and connected to recording spirometers.

In addition to the bronchospirography catheter, the equipment consists of two monometers, one for each inflatable bag, these measure the amount of pressure necessary to inflate the bags to a given diameter. A 2 per cent solution of nupercaine is used for topical anesthesia of the pharynx, and a 4 per cent solution of cocaine to anesthetize the larynx, trachea, and left bronchus.

The author emphasizes that confidence and cooperation of the patient are most essential so he explains the procedure to the patient before beginning. The patient is seated behind the fluoroscopic screen and the chest is studied. Under visual control with the aid of the laryngeal mirror, the catheter is introduced between the cords, and fed into the trachea for a few centimeters. Patients may become dyspneic, if so, a time is given for readjustment and the procedure is completed under fluoroscopic control.

The most important contraindication is tuberculous ulceration of any part of the larynx, trachea, or bronchi. Intubation should not be done in patients who are extremely dyspneic because of pulmonary or cardiac disease. Patients who have high fever or who are otherwise very ill should not be subjected to intubation.

PAUL MERRELL, M.D.

Leiner, G., Finner, M., and Zavad, W. A.: Bronchospirography Application to Collapse Therapy: Preliminary Report. *J Thoracic Surg* 940, 1940.

The authors state that more than 7 bronchospirographic examinations are done on about 60 patients. From the data so obtained it is their wish to know (1) how the disease influences the mechanism of respiration, separately for each lung, and (2) how the various collapse measures alter these mechanisms with particular reference to the compensatory processes that intervene in the maintenance of normal respiratory function within certain limitations. Five case reports are then given along with the bronchospirographic studies before and after thoracoplasty.

In the 5 cases presented, some of the compensatory mechanisms following collapse therapy have been pointed out. They comprise reduction in the reserve air, decrease of the ventilation equivalent (improvement of the economy of respiration) and increased oxygen consumption by the contralateral lung through increased respiratory labor. Significant increase of the respiratory rate occurred in only patient who had paralyzed diaphragm.

In only 4 of total of 20 patients on whom spirographic studies are made before and following some form of treatment, significant rise in the respiratory rate occurred in the presented here (thoracoplasty and permanent phrenicectomy) in the pneumoperitoneum with thoracoplasty and in pneumothorax complicated by effusions. These observations are suggestive of the importance of the diaphragm in ventilation.

In general, it can be said that collapse measures (1) may not necessitate contralateral compensation because they may eliminate only functionally dead space (2) thereby improve function (3) may call forth compensation without added work for the contralateral lung by improving the oxygen consumption through cardiovascular factor and (4) may cause increased respiratory labor for the contralateral lung in the form of increased minute volume, either through an increase of tidal air or of respiratory rate. F. C. MERRILL, M.D.

James, E. C., Althobson, D. B., and Forberg, A.: Extrapleural Pneumothorax. *J Thoracic Surg* 940, 1940.

The authors have reported their experiences with 77 patients who had extrapleural pneumothorax as established. As a result they state that the indications for this procedure are tuberculous cavities or infiltrations in the upper lung field under the following circumstances:

When intrapleural pneumothorax cannot be induced.

2. When intrapleural pneumothorax is incomplete on account of extensive adhesions and when these cannot be severed by closed intrapleural pneumolysis.

3. When collapse is urgently required to control severe hemoptysis.

4. When there are areas of infiltration about cavity which do not respond to bed rest.

5. When there is bilateral disease, long resistant to ordinary treatment and when thoracoplasty considered too dangerous.

6. When the patient are very young.

The authors think this procedure offers several advantages over thoracoplasty, namely: selective limited collapse with less encroachment on the normal lung tissue. It is also a one stage operation with no resulting deformity.

The contraindications are (1) large peripheral cavities, (2) hopeless extrapleural disease, (3) low vital capacity, (4) dense fibrotic lesions which render collapse and (5) dense adhesions encountered in operation.

The authors believe that their results in these cases have been satisfactory and that this procedure is a useful addition to other methods of collapse therapy. J. MAX A. MOORE, M.D.

Harter, J. S., and Lilienthal, A. A.: Extrapleural Pneumolysis I Artificial Pneumothorax. *J Thoracic Surg* 940, 1940.

The authors report their experience with the use of extrapleural pneumolysis to complete an ineffective intrapleural pneumothorax in 33 patients.

In 30 patients with bilateral disease with large cavities and extensive disease and an ineffective pneumothorax the pneumothorax as completed by this operation in addition, there are 3 patients who had small soft cavities or infiltrations without cavities and ineffective pneumothorax on whom this operation as done. Six of these 33 patients are very ill.

Satisfactory collapse was obtained in 3 of the 9 living patients. Three patients developed adhesions postoperatively but their conditions are greatly improved. One had thoracoplasty which re-expanded without reopening of the cavity. The spasm of all but patient is now negligible on concentration tests. It is too early to report results.

As a result of their experience the authors believe that this method may be used with comparative safety and considerable success in converting an ineffective pneumothorax to complete pneumothorax in cases in which the adhesions cannot be safely divided by the closed method, and on patients in whom thoracoplasty is contraindicated.

J. MAX A. MOORE, M.D.

García, D. C., and Beyer, M.: The Treatment of Abscesses of the Lungs (Aiguas considerations al tratamiento de los abscesos pulmonares). *Seneca Med* 940, 47 685.

The authors review the various methods of medical treatment of abscesses of the lungs and discuss the differences of opinion as to their effectiveness. Some authors claim that only those abscesses are cured that could have recovered spontaneously. It is known that spontaneous recovery does take place in abscesses of the lungs.

The authors describe and illustrate with roentgenograms 3 cases of their own treated by the following method (1) intravenous injection of a 20 per cent solution of alcohol in isotonic glucose solution in increasing doses from 30 to 40 c cm per day, (2) slow intravenous injection of a 20 per cent solution of sodium benzoate, in doses increasing daily until the optimum dose is reached (the latter differs in different cases), (3) administration of a solid, salt free diet, (4) moderate thirst treatment with small amounts of lemonade and orangeade, (5) postural drainage, and (6) administration of heart tonics and diffusible lung stimulants. The authors' results have been very encouraging in the 6 cases treated in this way.

They then discuss endoscopic treatment which is essentially an aspiration treatment. It is very effective in simple hilar or perihilar abscesses. In other cases it generally has only a palliative effect but it may be utilized as a measure preliminary to operation in order to avoid reflux of the pus into the opposite lung.

A new method that is being used to a considerable extent at present is that of short-wave therapy. The waves are applied for from five minutes to a maximum of from fifteen to twenty minutes with a maximum distance between the electrodes of 4 cm. Favorable results obtained by German authors are cited. The good effects are apparently due, not to heat as claimed by American authors, or to a bactericidal effect as claimed by the Germans, but, according to the theory of Pende, to a biological action. The irradiation acts directly on the cells, establishing electronic equilibrium and has an effect resembling that obtained in similar cases by Leriche by sectioning of the sympathetic nerves.

AUDREY G. MORCAN, M.D.

Vivoli, D. The Anatomicopathological Diagnosis of Bronchopulmonary Cancer (Diagnóstico anatómico y patológico del cáncer bronco pulmonar). *An de la catedra de patol y clin de la tuberculosis*, 1940, 2 32

On the basis of his extensive experience during the past five years, Vivoli recommends the use of the paraffin inclusion method to study the cancer cells occurring in the sputum and in the sediment of pleural effusions of patients with bronchopulmonary cancer. He found that the diagnosis could be established in from 80 to 85 per cent of the cases by applying the method to the sputum, in 60 per cent of the cases by applying it to the sediment of pleural effusions, and in 60 per cent by applying it to the material obtained by puncture of the tumor. On the other hand, bronchoscopic biopsy makes the diagnosis possible in 75 per cent of the cases, while thoracoscopy is also a valuable aid.

The paraffin inclusion technique for sputum includes the following steps:

The mouth is carefully cleansed, the first sputums of the morning are discarded, and then a good number of sputums are collected in a wide mouthed, 2 or 3 oz bottle, half filled with 96 degree alcohol, to

which 3 or 4 drops of acetic acid may be added. The alcohol is poured off and fixation and dehydration are completed with absolute alcohol, the absolute alcohol is changed three times, being allowed to act for thirty minutes each time, and the sputum is then left in the alcohol for twenty four hours. The agglutinated sputum is put in a test tube and treated in the same manner as with the absolute alcohol, first with xylol and then with paraffin at 56° or 58° C. To keep the paraffin at the necessary temperature for twenty-four hours, the tube is placed in the incubator at 60 degrees, the paraffin is then allowed to cool and harden, the tube is broken, and the paraffin mold is cut in serial sections having a thickness of 5 or 6 microns. The sections are freed from paraffin, and stained and mounted in the usual manner.

The same technique is used for the treatment of the sediment, obtained by centrifugation of pleural exudate, and of the material collected by puncture of the tumor. Paraffin inclusion gives better results than the usual smears because it prevents deformation of the cells and preserves their relations as in tissue sections.

The author discusses the various etiopathogenic theories of cancer of the lung and the possibility of producing it experimentally by means of substances belonging to the tar group, substances containing an anthracene nucleus and combustion products of petroleum. The incidence of bronchopulmonary cancer is increasing gradually, it occurs much more frequently in men than in women, especially those between the ages of fifty and sixty years, and equally in both lungs. Bronchial cancer is by far the most frequent and is localized most often at the hilus and at the lower third of the main bronchus. Its size depends on the stage of its evolution, its site, and the degree of resistance offered to its growth by the interlobular connective-tissue tracts and the pre-existing bands of sclerosis resulting from previous inflammatory processes. Various anatomicopathological classifications have been proposed.

The author has adopted an anatomicoclinical classification and describes the following forms with examples: original bronchial, hilar, mediastinopulmonary bronchopleuropulmonary (pleural of Roussy and Huguenin), radiating or fanlike, circumscribed nodular (Huguenin), multiple nodular, infiltrative or pneumonic (massive of Letulle), cavernous (primarily cavernous of Letulle), and miliary. Atelectasis, bronchial dilatation, pneumonic or bronchopneumonic processes, abscess, gangrene, and pulmonary perforation are the most frequent complications. Cancerous lymphangitis is found in all cases and the pulmonary veins are usually invaded. Metastasis is usual and appears, in a decreasing order of frequency, in the lymph nodes of the anterior mediastinum, the intertracheobronchial and interbronchial regions, in the supraclavicular lymph nodes, and in the axillary lymph nodes. Metastasis to other organs, such as the liver, kidneys, and suprarenal glands, occurs by way of the circulatory route. Metastasis to the other lung is possible by the respi-

ratory root. The thorax presents a complete classification of tumors of the lung from the histological point of view and describes each form.

RICHARD KESSEL, M.D.

HEART AND PERICARDIUM

Anderson, R. G.: Non-Penetrating Injuries of the Heart. *Brit. M. J.* 940, 307

Attention is drawn to the frequency of non-penetrating wounds to the heart, many of which pass unrecognized. A review of the literature reveals that until recently only the more severe injuries of this type, involving rupture of the heart, which is nearly always fatal, had been recognized. Animal experiments, in which the heart had been exposed and traumatized by blows, proved that there were many cases not involving rupture of the heart which presented certain clinical findings that are of assistance in the diagnosis of such injuries in man.

Traumatic heart disease may involve the pericardium, the myocardium, and the endocardium. Fibrous and purulent pericarditis occur in cases of traumatic heart disease, and adherent pericardium, hemopericardium, and Pick's disease with calcifications of the pericardium have been found at autopsy. A blood-stained pericardial effusion was found in half the experimental cases, in which the exposed hearts of dogs were traumatized, as reported by Bright and Beck. Lesions of the myocardium may be either contusions, with softening of the involved tissue and the gradual formation of scar tissue or actual rupture of the heart muscle. Rupture may involve just a few fibers, or it may present complete tearing of the heart. It depends largely upon the force of the injury. Contusions may lead to rupture because of the softening of the bruised region. It is most likely to occur in the second week after the injury. Rupture of the valves or of the chordae tendineae appears to be very rare. Occasionally subendocardial hemorrhages are found after trauma.

Initial symptoms in patients who survive the immediate effect of trauma to the heart (such as auricular fibrillation or a massive tear of the heart muscle) are transient collapse, usually without loss of consciousness, followed by precordial pain, a sensation of tightness in the chest, dyspnea, palpitation, or faintness. A symptom-free period may follow in which the patient feels well and is able to exercise normally.

Physical signs include acute dilatation, an increase in the area of cardiac dullness (which may be due to pericardial effusion), the appearance of a thrill or murmur especially in cases in which there was none before, weakness of the heart sounds and a characteristic "tick tick" quality of the sounds, muffling of the heart sounds due to developing effusion, pericardial friction, and abnormalities of rhythm in cases in which these were not present before the injury. A persistent tachycardia with normal temperature is suggestive. A few days after

the injury there may be temperature rise and a slight leucocytosis.

The electrocardiogram gives fairly constant findings in cases of this sort, the T waves being most frequently affected. These waves are commonly inverted; they may be unusually large or typical coronary T-waves may occur. The Q-wave may be abnormally deep, and the QRS complex may be slurred or notched. Various forms of arrhythmias may be found. It is important to be certain that the electrocardiogram is normal before the injury.

The early diagnosis of this condition is important because correct treatment may prevent cardiac rupture. The author recommends six weeks' rest in bed, morphine for the relief of pain, digitalis if signs of congestive heart failure should appear, and quinidine for certain cases of arrhythmia or fibrillation. Paracentesis should be performed for large pericardial effusions.

A case of traumatic heart disease in a man of thirty years, with recovery, is reported in detail.

J. E. THOMAS, M.D.

ESOPHAGUS AND MEDIASTINUM

Cherf, L. H.: Diseases of the Esophagus; Esophagoscopic Considerations. *Arch. Surg.* 940, 1-443

The common symptoms of esophageal disease are dysphagia, odynophagia, regurgitation, loss of weight, and hematemesis. Other symptoms which may be present are hoarseness, dyspnea, and cough, and these are usually due to the spread of a neoplasm to the surrounding structures or to pressure by large diverticula. Dysphagia is the most common and often an early symptom, and, even if mild, should focus attention on the esophagus.

In the study of diseases of the esophagus, complete history and general physical examination are necessary. The study of the local condition should include careful inspection of the upper air passages, mouth, pharynx and neck, fluoroscopic study of the chest and the esophagus with the use of opaque mixtures, and finally esophagoscopic examination with biopsy when indicated.

Congenital anomalies of the esophagus as stricture are usually fatal within a few days of life. The diagnosis is easily made by x-ray examination with a small quantity of barium. Congenital esophageal stenosis, however, and short esophagus with thoracic stomach are compatible with life and may go unrecognized for years. In these cases there is usually a very long history of dysphagia.

Acute esophagitis usually follows the swallowing of an irritant or caustic. As a rule, ulcers and stenosis result. Chronic inflammation may be caused by overindulgence in alcohol or highly seasoned and hot foods. In the acute stage the esophagus should be placed at rest by either liquid diet or by gastrostomy. Bismuth subnitrate or ethyl-aminobenzoate are useful to relieve the pain.

Benign esophageal ulcer usually occurs in the lower end of the esophagus. Painful swallowing is an

outstanding symptom, the pain occurring usually retrosternally. X-ray and esophagoscopic examinations are diagnostic. Tuberculosis and syphilis of the esophagus sometimes occur, also Vincent's infection and blastomycosis.

Venous varices may occur, usually at the lower end of the esophagus, and can be seen very readily during esophagoscopy. Cicatricial stenosis and compression stenosis can be diagnosed by x-ray study and esophagoscopy. For the former condition, bougienage by mouth or retrograde bougienage through a gastrostomy should be carried out, but always with a swallowed string as a guide.

Pulsion diverticula occur at the level of the cricopharyngeus muscle. They usually cause dysphagia, gurgling in the throat, stale sour breath, and regurgitation of old food. X-ray examination is diagnostic. Traction diverticula occur in the lower portion of the esophagus. They are usually due to inflammation of the surrounding structures and seldom cause symptoms. Cancer of the esophagus may start very insidiously and vague dysphagia may be the only early symptom. Regurgitation, loss of weight, pain, and hematemesis are late symptoms. Thorough investigation by x-ray study and esophagoscopy with biopsy will lead to early diagnosis of cancer of the esophagus. Surgical removal of the growth offers the greatest hope but the procedure is a formidable one.

Foreign bodies in the esophagus should present no difficulties in diagnosis if the condition is kept in mind as a possibility and a thorough study is made.

SAMUEL PERLOW, M.D.

Ochsner, A., and DeBakey, M. *Surgical Considerations of Achalasia, Review of the Literature and Report of 3 Cases*. *Arch Surg*, 1940, 41: 1146.

A variety of terms have been applied to the clinical syndrome characterized by dilatation and hypertrophy of the esophagus associated with non organic obstruction of the cardia. These include cardiospasm, achalasia, phrenospasm, idiopathic dilatation of the esophagus, esophagectasia, hiatal esophagismus, mega-esophagus, simple ectasia of the esophagus, preventriculosis, dilatatio ingluvisformis esophagi, dilatatio fusiformis, and dolicho esophagus. The multifarious designations clearly reveal the controversies regarding the causation and the bewildering pathogenesis of the condition. These are further reflected by the various types of therapeutic procedures which have been employed.

The authors review various theories of the pathogenesis of achalasia, and it becomes obvious that there are considerable diversity of opinion and conflict of views regarding the development of the condition. A great variety of therapeutic measures have therefore been advocated and employed. In general, these procedures may be classified into the conservative and the radical. In this presentation no attempt is made to discuss the former, although it should be realized that they should always be attempted first. It is generally agreed that the radical

procedures should be instituted only after the conservative measures have failed.

The various types of radical procedures which have been advocated and employed are classified into four large groups, depending on whether they are directed at (1) the dilated esophagus, (2) the cardia, (3) the diaphragm, or (4) the nerve supply. A brief historical consideration of each procedure is presented. The various operations are described and illustrated, and the collected cases are analyzed.

The procedures directed at the dilated esophagus and based on an attempt to reduce the size of the circumference by esophagoplication are irrational and are considered of historical interest only.

Four types of procedures have been directed at the cardia: (1) dilatation, (2) plastic operation, (3) excision, and (4) deviation.

Dilatation of the cardia has been done by retrograde bougienage and transgastrically by instruments or fingers. Among 80 cases collected from the literature in which the latter procedure was used 7 (8.9 per cent) of the patients died and 8 (10.1 per cent) of the operations were failures.

The plastic procedures consist of extramucous cardiomyotomy or cardioplasty (Fig. 1). Among 104 collected cases in which the former was employed there were 4 deaths and 14 recurrences. Among 36 cases in which the latter was used there were 1 death and 1 recurrence.

Excision of the cardia followed by esophagogastrostomy has been done in 2 cases, in 1 of which the patient recovered. Such a radical procedure, in the authors' opinion, is justified only in the presence of a malignant tumor.

Of the various procedures directed at the cardia, esophagogastrostomy is considered the most rational. This may be performed either by side to side anastomosis between the esophagus and the fundus of the stomach or, preferably, by an anastomosis similar to the Finney gastroduodenostomy, which obviates the cardiac spur in the esophagus and thus creates a wider opening between the esophagus and the stomach (Fig. 2). In 88 cases collected from the literature in which esophagogastrostomy was performed there were 5 deaths (6.6 per cent) and only 1 poor result.

Operations directed at the diaphragm consist of phrenotomy and mobilization of the esophagus downward. In 21 collected cases in which these measures were used there were no deaths, and the results were stated as good in 12 (57.1 per cent), and as showing improvement in 3 (14.3 per cent); failures resulted in 6 (28.5 per cent).

The procedures directed at the nerve supply may be classified into those attacking the vagus nerves and those attacking the sympathetic nervous system. Among 11 collected cases in which operations of the former type were done, 3 patients died, 7 recurrences developed, and only 1 satisfactory result was recorded. In 19 collected cases in which operations of the latter type were done there were 1 death due to peritonitis and 1 to suicide. There was a recurrence

in 4 cases, and partial improvement was observed in 4.

Three cases reported by the authors. An esophagogastrostomy was done in 2, with excellent results. A sympathectomy was performed in the other with recurrence. *SURGERY*, H. KURTZ, M.D.

Lawman, T. H. Congenital Atresia of the Esophagus. A Study of 22 Cases. *Arch. Surg.* 940-4.

All types of congenital atresia of the esophagus are due to faulty division of the foregut which forms the lung bud and the esophagus. Various types of atresia are found: (1) complete atresia of the esophagus, (2) blind end of upper and lower segment without communication with the trachea, (3a) the upper segment communicating with the trachea and the lower end blind, (3b) the upper segment blind end and the lower segment communicating with the trachea (this is the most common type) and (3c) both upper and lower segments communicating with the trachea. Most of these cases are associated with developmental anomalies elsewhere in the body.

In study of 22 cases, 3 of which were operated on, it is found that 9 per cent had a tracheo-esophageal fistula.

The author recommends a direct track from the fistula through the extrapleural approach. If direct anastomosis is possible it should be done. If that is not possible the tracheo-esophageal fistula should be closed and a second operation done soon possible. Exteriorization of the upper segment and an anterior gastrostomy should be performed.

SURGERY, FRANK M.D.

Walters, W. Moersch, H. J. and McKinnon, D. A. Bleeding Esophageal Varices: an Evaluation of Methods Directed Toward Their Control, Especially by Direct Injection of Sclerosing Solution. *Arch. Surg.* 940, 4.

Esophageal varices develop as a result of the obstruction of the portal and splenic veins and bleeding occurs because of their superficial position relative to the esophageal mucosa. Although both disease and splenic anemia are the conditions most frequently associated with esophageal varices, they cannot be regarded as distinct clinical entities.

The surgical treatment of splenic anemia has been directed toward removal of the enlarged spleen on the assumption that it is contributing toward the destruction of red blood cells, and, in addition, because splenectomy reduces the amount of blood flow to the portal vein by an amount ranging from normal of approximately 50 per cent to a much larger percentage when the splenic vein and its branches enlarge. In the enlargement of the spleen. In addition, in splenectomy the veins communicating between the splenic vein and the cardia of the stomach and esophagus through the short gastric veins and gastrosplenic ligament are interrupted by division and

ligation which helps to decrease the amount of venous blood passing through the esophageal veins. After removal of the spleen the denuded surface of the parietal peritoneum forming its previous bed may be the site of formation of collateral veins between the portal and caval systems.

Although the operation of splenectomy for splenic anemia has been followed by good results in a large series of cases it is apparent that even when combined with ligation of the coronary vein or esophagotomy it does not prevent recurrence of bleeding from the esophageal varices in more than 35 per cent of the cases.

Although it has been shown that portal cirrhosis, considerable flow of blood occurs through the coronary vein which anastomoses with the internal mammary vein at the cardiac end of the stomach and in the esophagus and that ligation of this vein in the gastrosplenic omentum will serve to interrupt this flow of blood, this procedure has been used alone in too few cases of splenic anemia to permit any conclusion relative to its merits in reducing the incidence of hemorrhage from esophageal varices in such cases.

The recent success in obliteration of esophageal varices by the injection of sclerosing solutions into them through the esophagoscope and results obtained in the 6 cases reported in this paper in which the injection, as done at the May Clinic, is such extensive that this is a procedure worthy of trial in order to determine the permanency of its result.

Garlock, J. H. The Surgical Treatment of Carcinoma of the Esophagus. *Arch. Surg.* 940, 4.

Until recent years the diagnosis of cancer of the esophagus frequently made late in the disease too late for surgical treatment, and such a diagnosis was an ominous one with fatal prognosis. The results of radiation therapy for esophageal carcinoma have been universally disappointing. Encouraging progress, however, has been noted in the radical surgical treatment of this disease if the patients have been referred early before local or peripheral infiltration and metastases have taken place. It is important to stress that the physician must regard with suspicion any disturbance in the act of swallowing in a patient past thirty-five or forty years of age and make every effort to determine whether or not neoplasia is present. It should include careful roentgen investigation with thick and thin contrast media and esophagoscopy; the latter to obtain biopsy specimens and to determine the distance of the tumor from the upper incisor teeth. The last mentioned factor is of importance because it helps the surgeon to decide which type of operation should be undertaken.

It is most important to prepare the patient thoroughly so that the risk of the operative procedure may be minimized. This should include attention to oral hygiene, high caloric liquid diet containing the necessary vitamins and minerals, blood transfusion, and parenteral fluids, if necessary. The author also

employs sulfanilamide pre-operatively. A second line of attack against the bacterial flora of the ulcerated neoplasm consists of mechanical cleansing of the esophagus by frequent irrigations of warm boric acid or saline solution through a Levine tube. Pre-operative pneumothorax and crushing of the phrenic nerve do not seem to be necessary.

If the neoplasm is located in the upper two-thirds of the esophagus, a gastrostomy will be indicated. The Janeway gastrostomy, or better still, the Spivack valve gastrostomy, has been used pre-operatively, but recently the author has changed the plan of procedure. If the patient is in good condition, preliminary gastrostomy is not performed. Instead, during the thoracic part of the esophagectomy, the remaining lower esophagus (carefully covered by a rubber envelope to prevent contamination) is pushed through the diaphragmatic opening into the abdomen, and after completion of the thoracic procedure, this esophageal stump is brought out through a small left rectus incision as an esophagostomy. In this way the sphincter mechanism of the cardia is preserved and no leakage of gastric contents can take place. Another advantage of this new procedure is that the subsequent antethoracic esophagoplasty may be completed in one stage without fear of regurgitation of the gastric secretion, which ordinarily causes digestion of the skin-lined tube.

If the carcinoma is located in the distal third of the esophagus, preliminary gastrostomy should not be carried out, because the presence of a gastrostomy will seriously interfere with the performance of an intrathoracic anastomosis between the stomach and the esophagus, the operation of choice for neoplasms in this situation.

The anesthesia recommended is a combination of avertin and ethylene or cyclopropane. The inhalation anesthetic must be administered with varying degrees of positive pressure during the operation to influence the extent of inflation of the lung. Complete collapse of the lung must not be permitted to take place at any time during the operation.

For purposes of discussing the operative treatment of carcinoma of the esophagus, the organ has been divided into three portions, namely, the upper third, from the hypopharynx to the level of the arch of the aorta, the middle third, from the latter level to a point about 34 or 36 cm. from the upper incisor teeth, and the lower third, from this level to the cardia.

The methods for removal of carcinoma of the upper third of the esophagus depend upon the location of the tumor (hypopharyngeal, cervical, or supra-aortic), its size, and the amount of infiltration into the surrounding structures. The methods include lateral esophagotomy and local excision of the tumor, cervical esophagectomy, with or without laryngectomy, and upper posterior mediastinotomy.

The author employs the Torek operation, which he has modified in some aspects to simplify the steps and shorten the operation, for the removal of carcinomas of the middle third of the esophagus. The

operation is described and illustrated in detail in the article and consists essentially of partial resection of the esophagus through a left transpleural approach, and cervical esophagostomy of the upper esophageal stump through a separate cervical incision, if preliminary gastrostomy has not been done, the lower esophageal stump is brought out through a separate abdominal incision as described above.

Postoperatively, at about the end of the second week, the continuity of the esophagus may be restored by a rubber tube placed from the cervical esophagostomy to the abdominal esophageal or gastrostomy opening.

Carcinomas of the lower third of the esophagus, arising from the esophageal mucosa, by virtue of their pathological nature and type of lymphatic spread, are more amenable to radical resection than the adenocarcinomas of the cardia of the stomach. However, the same operation is applicable to cardiac carcinomas, if preliminary abdominal exploration indicates operability.

All the evidence to date indicates that transthoracic resection with esophagogastronomy in one stage is the procedure of choice for carcinoma of the lower part of the esophagus. The operation, a modification of the original Sauerbruch and Fischer operation, consists of a transthoracic approach on the left side, incision of the diaphragm, mobilization of the upper two-thirds of the stomach, resection of the tumor-bearing area, performance of a careful suture anastomosis between the end of the esophagus and the anterior wall of the stomach in two layers and telescoping of the esophagus into the stomach by drawing the latter organ upward in a sleeve-like manner around the esophagus in order to minimize any possible drag on the suture line.

The author also describes and illustrates this operation in detail. Small sips of water may be given on the fifth or sixth postoperative day. If nothing appears through the thoracic drainage tube, it is assumed that the suture line has healed and is intact. Increasing amounts of liquid are not given until about the sixteenth day, when custards, jellies, and cereals are permitted. The diet is rapidly increased thereafter. Solid food should not be given until the third or fourth week.

The lumen at the site of anastomosis may diminish in caliber during the succeeding two or three months. If this happens, bougienage through an esophagoscope will become necessary. Such treatment should not be undertaken until there is reasonable assurance that the repair at the site of anastomosis is solid.

Up to the time of writing, the author has operated on 17 patients with carcinoma of the esophagus. Of this group, 6 were found to be inoperable, and 11 were treated by radical resection. The operability percentage was 64.7. In the group of 11 patients subjected to resection, 3 died postoperatively, a mortality of 27.2 per cent. One patient died of a tension pneumothorax on the right side. This death was probably due to an error in judgment and could

have been prevented. The second patient died of a cerebral hemorrhage resulting in hemiplegia seventy-two hours after operation. At autopsy the intra-thoracic situation was found to be satisfactory and the anastomosis between the stomach and the esophagus was intact. There was no evidence of infection. The third patient, physician of fifty-four died twelve hours after operation, of shock. The tumor in this instance was firmly attached to the diaphragm and the right pleura. The operation was unusually difficult and consumed almost four hours. A topsy was not permitted.

I 7 of these cases the modified Torek operation was performed, with death. I the remaining 4, resection with intrathoracic esophagogastronomy was carried out with death. The late results in the patients who survived operation are of considerable importance. Of the 8 survivors, 2 died of a recurrence in the superior mediastinum twenty-three months later; 2 died of coronary disease after three months, and died of generalized metastases one year after operation. The 5 survivors are alive and well three and half years, eleven months, seven months, six months, and one month, respectively after operation. In the second and third cases resection with esophagogastronomy was performed.

I addition to the aforementioned group, the author has operated on additional patients with carcinoma of the cardia secondarily involving the lower part of the esophagus. Three of these were found to be operable, operability rate of 30 per cent. In these 3 patients transthoracic resection with esophagogastronomy was performed. There were postoperative deaths. One patient, a woman of seventy-two in only fair condition, seemed slowly to disintegrate during the following three days. At post mortem examination the cause of death was not demonstrable. The suture line was intact, and there was no evidence of infection. The second patient died suddenly of a cerebral embolism on the third day. At autopsy the anastomosis was found to be intact, and there was no infection. The third patient is alive and well eight months after operation. The cases comprising this group will form the basis of a subsequent paper.

SURGERY II. KLEIN, M.D.

Textor, H.: Carcinoma of the Esophagus and the Result of Surgical Treatment (Der Speiseröhrenkrebs und die Erfolge der operativen Behandlung). Gießen, Dissertation, 1939.

I from a study of the patients at the Gießen surgical clinic from the years 1900-1939 and review of the literature the author discusses the following aspects of carcinoma of the esophagus: age and sex incidence, cause, forms, symptoms, diagnosis, local invasion, metastases, complications, and treatment.

During this period 3 patients with carcinoma of the esophagus were treated in the clinic. One hundred and ninety-three of them were males. There were 46 farmers, 39 laborers, 31 artisans, 9 public officers and employees, professional men, and 19 invalids. Most of these patients were between fifty

and seventy years of age. The importance of diagnosis at the earliest possible moment is repeatedly stressed.

The carcinoma was located in the upper third of the esophagus in 8.44 per cent of the patients, in the middle third in 59.74 per cent, and in the lower third in 31.82 per cent. Metastases were present at the time treatment was begun in 0.33 per cent of the patients. The regional lymph nodes were involved in 3 per cent, the liver in 25 per cent, the peritoneum in 50 per cent, the stomach in 1 per cent, and the lungs, thyroid and vertebrae each in 5 per cent of the cases.

The author divides the various types of treatment for this disease into two groups. In the first group he includes medical treatment, dilatation, intubation, electrocoagulation, neurotomy, esophagogastronomy and radium therapy, and in the second group operative removal of the tumor. The methods in the first group, all of which are carefully described, are only palliative measures to partially alleviate the more severe symptoms.

A gastrostomy was made in 73 patients at the clinic with an operative mortality of 15.7 per cent and an average postoperative duration of life of one hundred and forty-six days. The average duration of life among patients who received no treatment after their discharge was one hundred and eighty days. "If one also considers those who died in the clinic in the study of the postoperative duration of life a prolongation of life through gastrostomy would become scarcely more than word. The average duration of clinical symptoms was five months.

The procedures for operative removal of the tumor may be classified into extrapleural, transpleural, and abdominothoracic types. Six patients were operated upon at the clinic by the last method. Four of these patients died shortly after operation because there were already large areas of infiltration of the carcinoma into the neighboring organs. Two patients recovered. One of the latter was sixty-year-old woman who was operated upon by A. W. Fischer on January 4, 1936, and the other is a sixty-one-year-old farmer who was operated upon by Bernhardt on August 6, 1938. Both are in good health in 1939.

A four-page bibliography completes this introduction. (SALTZ) LEONARD W. GIBBS, M.D.

Heuser, G. J. and Andrus, W. DeW.: Surgery of Mediastinal Tumors. *Am J Surg*, 1940, 59: 141.

The mediastinum harbors an extraordinary variety of benign and malignant tumors. These include the dermoid cysts and teratomas, the cysts of endodermal and mesodermal origin, the cystic lymphangiomas, and the echinococcal cysts. The connective tissue tumors include fibromas, lipomas, leiomyomas, xanthomas, chondromas, chondrosarcomas, and chondrosarcomas. Neurogenic tumors include neurofibromas, ganglioneuromas, neuroblastomas, and neuro-epitheliomas, and the benign and malignant

tumors of the thymus gland, the primary tumors of the mediastinal lymph nodes include lymphosarcoma, Hodgkin's disease and endotheliomas, the primary and secondary sarcomas, the rather heterogeneous group of primary and metastatic carcinomas, and the intrathoracic goiters.

Occasionally a mediastinal tumor may be asymptomatic and is discovered during the course of a routine physical examination. However, when mediastinal tumors give rise to symptoms these may be of two kinds, general or local. By general symptoms is meant the common symptoms of pain in the chest, cough, dyspnea, and cyanosis. They are the result of mediastinal compression, and vary with the size and location of the lesion and the degree of compression of the various mediastinal structures.

In addition to these general manifestations of mediastinal tumors are other signs which may be designated as local in the sense that they are visible through local swellings or are due to implications of structures in the immediate neighborhood of the lesion. Visible swelling over the chest or in the suprasternal region (in rare instances with pulsation), dilatation of the veins of the neck and front of the chest sometimes associated with edema of the face, inequality of the pupils or a definite Horner's syndrome, hoarseness due to pressure upon the recurrent laryngeal nerve, dysphagia due to pressure upon or dislocation of the esophagus, herpes or neuralgia due to pressure upon the intercostal nerves—all are manifestations of mediastinal tumors, which are observed with variable frequency, and some at times have a definite localizing value. The occurrence of Horner's syndrome, for example, suggests not only a lesion of the posterior mediastinum but one involving the paravertebral sympathetic chain.

The symptoms just enumerated are due largely to mechanical causes, and not infrequently death in mediastinal tumors is due to mediastinal compression and its effects upon the respiration and circulation. In malignant lesions anemia, loss of weight and strength, and irregular fever occur as in other malignant tumors but are seen less frequently, perhaps because of earlier death from the compression. It should be recognized that tumors of the mediastinum may cause symptoms referable to the spinal cord, and, conversely, tumors arising within the spinal cord may extend into the mediastinum.

In the diagnosis and differential diagnosis of mediastinal tumors, all the resources of the internist, roentgenologist, bronchoscopist, and surgeon may be necessary. Careful physical, roentgenographic, bronchoscopic, and sputum examinations will serve in some cases to establish not only the presence and location of the lesion but also its pathological nature. In some cases, especially those in which the tumor is near the thoracic wall, an aspiration biopsy may serve to establish the pathological diagnosis, in others, the removal of an accessible involved gland, or the response of a lesion to a controlled dose of roentgenotherapy may be of diagnostic value. However, experience shows that in not a few cases all our

present diagnostic methods fail to establish the pathological nature of the tumor, although they do establish its presence and its location within the mediastinum.

Usually, in the authors' experience, a clearly defined, circumscribed shadow in an x-ray film is most often cast by a benign tumor, although this does not rule out such lesions as ganglioneuromas or teratomas which have undergone malignant degeneration, certain sarcomas, or lesions other than tumor, as mediastinal abscess and non-pulsating aneurysms. Again, the diffuse, poorly defined, irregular shadow is most often associated with malignant conditions, a finding to which also there may be exceptions. Less important than the roentgenogram is the diagnostic information obtained from the particular location of the lesion. Tumors in the posterior mediastinum are particularly apt to be the ganglioneuromas or other neurogenic neoplasms arising from the sympathetic chain or thoracic nerves, or the various forms of chondroma arising from the costovertebral articulation or intervertebral discs. The dermoid cysts almost always occur in the anterior mediastinum. Frequently, however, such distinctions have no meaning, for when the tumors reach any considerable size they may defeat all efforts to determine their exact site of origin. It must be admitted, when all is said, that one of the handicaps to more intelligent treatment of mediastinal tumors lies in our diagnostic limitations.

In the treatment of mediastinal tumors the question of surgical removal or roentgenotherapy naturally arises. From the authors' observations there would appear to be a tendency on the part of the profession to treat mediastinal tumors primarily by radiation. The opinion seems to be prevalent that x-ray therapy may achieve satisfactory results, and if it fails to do so, surgery may then be considered. The authors would suggest that this attitude be reversed, that upon the discovery of a mediastinal tumor the surgeon, experienced in thoracic surgery, should be consulted, and not until he has concluded that surgery is inadvisable should x-ray therapy be undertaken. Certain benign tumors and some of the malignant tumors are amenable to surgical removal and in general these fail entirely to respond to x-ray therapy. Not only does x-ray therapy fail to reduce their size but it may fail also to prevent their malignant degeneration. It may make subsequent attempts at surgical removal more difficult and hazardous because of the production of massive adhesions. It may be not only a wasted effort but one productive of harm to the patient.

The authors have found that intratracheal anesthesia is the most satisfactory for operation upon mediastinal tumors, and they especially recommend the use of cyclopropane gas.

Generally speaking, the mediastinal tumors may be exposed by one of three operative approaches, namely, the anterior, lateral, or posterior. The anterior approach is applicable to tumors of small and medium size situated in the anterior mediastinum.

The lateral approach is used in cases of the large mediastinal tumors which have extended laterally into one or the other pleural cavity. The posterior approach is satisfactory for the tumors which occupy the upper posterior mediastinum. The operative technique for each of these methods is described.

The various types of tumors of the mediastinum are taken up in detail, and their pathology, symptomatology, diagnosis and treatment are described. Illustrative case reports are given also.

The article includes a large bibliography. The latter is classified under the headings of the various types of mediastinal tumors enumerated.

SURGEON, H. KAPP, M.D.

MISCELLANEOUS

Lambert, A. V. B. The Etiology of Thin-Walled Thoracic Cysts. *J. Thoracic Surg.* 1940, 10.

Lambert has reported cases of thin-walled cysts occurring within the thorax, which were successfully removed by Berry. He reports another operated on by Butler and calls attention to one operated on by

Pekhart. These are called endothelial cysts of the mediastinum.

These cysts are easily distinguished from other thoracic cysts, dermoid cysts and teratomas by examination of their walls. They are not easily distinguished from lymphangiomas. It is impossible to tell the difference between mesothelium and endothelium microscopically. However lymphangiomas are multilocular and are composed of conglomerate masses of individual cavities which vary greatly in size. In addition lymphangiomas are intimately incorporated with the various structures around which they are situated. There is no sharp line of cleavage; they cannot be shelled out and at times removal has been accompanied by profuse bleeding.

Lambert traces the embryological development of the pericardium and holds that in all probability these reported cysts are due to the fact that one of the primitive lacunae failed to merge with the others, persisted, and developed into an independent cavity forming a cyst. These cysts should be called pericardial embryonic cysts. J. W. A. M. M. D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Shalagin, M. A. The Defensive Role of the Peritoneum and Omentum in the Fight Against Bacteria, the Role of Trauma in the Development of Peritonitis *Vestnik khir*, 1940, 59 610

In order to test the defensive power of the peritoneum and omentum against infection and to study the rôle of trauma of the abdominal muscles in the development of peritonitis, the author conducted 2 series of experiments. In the first series he introduced into the peritoneal cavity of rabbits and dogs various numbers of hemolytic streptococci and colon bacilli, in the second series he carried out the same procedure and, in addition, traumatized the abdominal muscles. The virulence of the microorganisms was determined on white mice. A suspension of bacteria was introduced into the abdominal cavity through a midline incision under strict aseptic conditions, and the peritoneum was closed without drainage. After the animals died or were killed, cultures were made from the peritoneal exudate, parenchymatous organs, and blood was obtained from the blood vessels and heart.

Dogs were found to be very resistant to an intra-peritoneal infection with hemolytic streptococci. They succumbed to a dose of two billions of bacteria or more per kilogram of body weight. The introduction of large numbers of hemolytic streptococci or of colon bacilli produced a fatal peritonitis without any evidence of a previous trauma involving the peritoneum.

In the second series of experiments the abdominal cavity was opened through a midline incision, the intestinal loops were pushed to one side, a 5 by 6 cm section of the posterior parietal peritoneum overlying the quadratus lumborum muscle was excised, and the muscle was crushed with strong hemostats and smeared with a suspension of microorganisms. The incision was closed without drains. A fatal acute septicemia developed under such circumstances after the introduction of a number of microorganisms from 20 to 30 times smaller than that necessary for the production of fatal peritonitis without muscular trauma.

Apparently the virulence of bacteria and the presence of local and general favorable conditions are more important for the development of pathogenic microorganisms than their number.

Cultures from the internal organs of animals which succumbed to an intraperitoneal infection with hemolytic streptococci or colon bacilli showed a growth of the corresponding bacteria. In animals which recovered from the infection, all tissues and organs were found to be sterile after ten days.

A grave course of peritoneal septicemia in animals with traumatized muscles may be ascribed not only to the presence of dead tissues serving as a nutrient

medium, but also to the development of toxic products in deteriorated muscle tissues.

JOSEPH K. NARAT, M.D.

Shelley, H. J. Direct Inguinal Hernias, A Study of 605 Hernias and of 565 Repairs *Arch Surg*, 1940, 41 857

The author points out that division of inguinal hernias into indirect and direct types as a clearcut grouping is not possible. In considering the etiological factors it was found that the average age at which direct inguinal hernias were first noted was ten years later in life than the corresponding age for incomplete indirect inguinal hernias. While a small percentage of these hernias was noted from the twentieth to the twenty-fifth year of life, most of the hernias were first noted in the period between the ages of twenty-five and fifty-five years with the highest incidence in the fifth decade of life. The average age (43.7 years) at the time of admission or operation was nine years later in life than that of patients with incomplete indirect inguinal hernias (34.8 years).

As to sex incidence, the great majority (96.9 per cent) of these hernias occurred in males. This percentage amounted to 88.7 in the cases of incomplete indirect inguinal hernias. Only 3.1 per cent of the direct hernias were found in females, which is about one-fourth of the incidence of incomplete indirect inguinal hernias in females.

The recurrence rate for direct hernias in males was double that for males after repairs of incomplete indirect inguinal hernias (15.2 and 7.5 per cent, respectively), while for females these figures were nearly the same.

A history of definite trauma as the etiological factor was given in a slightly greater proportion of cases among the direct inguinal hernias than among the incomplete indirect inguinal hernias. Also, a slightly greater percentage of patients gave a history of pain associated with direct inguinal hernias than with incomplete indirect inguinal hernias.

In the direct inguinal hernias fewer of the sacs extended into the scrotum than was found to be the case in the incomplete indirect inguinal hernias. The percentage of hernias which extended beyond the external ring, or were limited to the inguinal canal, was slightly more than one-third greater among the direct hernias. Repairs of direct inguinal hernias were followed by greater increases in the percentage of recurrence when the sacs were long than when the sacs were limited to the inguinal canal.

It was found that a smaller percentage of incarcerations occurred among the direct hernias than among the indirect hernias, although the percentages of strangulated hernias were practically the same in the two types.

The incidences of location (right or left) of direct and of incomplete indirect inguinal hernias were

the same. Nearly twice as great a proportion of direct inguinal hernias as of incomplete indirect inguinal hernias was bilateral, i.e., the hernias were associated with an inguinal hernia of some type on the opposite side.

As to operative technique, it was found that repair of direct inguinal hernias, and also of incomplete indirect inguinal hernias, by catgut suture of the rectus muscle or of the anterior sheath of the rectus muscle to the inguinal ligament is an unsatisfactory procedure. Even after elimination of the above mentioned type of repair from all operations in which catgut sutures only were used, greater incidence of recurrence was found than that which followed the use of fascial sutures. This was true notwithstanding the fact that greater percentage of the more difficult repairs as included in the fascial suture group.

Shelley's operative technique is as follows:

The conjoined tendon is sutured to the inguinal ligament with a fascial suture obtained from the aponeurosis of the external oblique muscle, after the technique of McArthur. Transplantation of the cord superficial to the aponeurosis of the external oblique muscle is not good as it invites more complications whether catgut or fascial suture is used.

Approximation of the cut edges of the external oblique aponeurosis will be facilitated by placing the first suture at the medial end of the incision to form the external ring and drawing the cord downward, so that it lies in a straight line in the inguinal canal before this first suture is tied.

It is the author's opinion that conversion of the direct sac into an indirect one in the direction of these hernias is distinct improvement over isolation of the sac through the transversalis fascia at the point where it extends into the inguinal canal.

The percentage of postoperative complications was twice as great after repairs of direct hernias as after repairs of incomplete indirect inguinal hernias.

The proportion of recurrences following repair of direct inguinal hernia was the same as that following repair of indirect inguinal recurrences and 50 per cent greater than that following repair of incomplete indirect inguinal hernias.

From Shelley's report it would seem that the use of a fascial suture is decidedly worth while.

MARTIN J. SHERRY M.D.

Joyce T. M. Fascial Repair of Inguinal Hernias.
J. Am. M. Ass. 940, 5 971.

The author briefly reviews the evolution of the treatment of inguinal hernia from early times. He believes that the use of fascia, particularly in the form of sutures, contributes in large measure toward the reduction of recurrences, and contends that if fascia is desirable in the repair of difficult hernias it is also desirable in the repair of hernias that are not difficult. His own practice repairs all types of hernias with fascial sutures.

His technique modifies and combines Halsted's transplantation of the cord, Andrew's imbrication of

the external oblique aponeurosis, and McArthur's use of Galilei fascial sutures. He emphasizes the importance of suturing fascia only to fascia. In his repair, a strip of fascia about 3 in. wide is cut from the edge of the superior flap of the external oblique and left attached to the pubic spine. Threaded on a needle of smaller caliber than the Galilei needle this fascial strip approximates the superior edge of the external oblique to the shelving portion of Poupart's ligament. The end of this strip is anchored with either chromic catgut. When the superior flap of the external oblique lacks sufficient fascia, and in the repairs of recurrent hernias, fascia is obtained from the thigh.

For the five-year period terminating January, 1930, the author reports a total of 760 operations, of which 544 could be traced. Some of these were performed by the author and other experienced surgeons, and some by resident surgeons and externs. There were 6 recurrences, a percentage of .04 for all the traced operations. The recurrence rate for 3 experienced individual surgeons was less than 1 per cent for a group of staff surgeons, .93 per cent and for a group of 2 externs and resident surgeons, 6.66 per cent.

There were 5 (.67 per cent) postoperative deaths and 8 wound infections. In 1 instance infection was followed by recurrence. Nictitular atrophy is observed in the series. The type of anesthesia appeared to be of no consequence.

JOHN L. LEECHER M.D.

Felblat R. The Surgical Management of Femoral Hernias and Its Late Results (Die Operation der Leistenhernien und ihre Spätergebnisse). *Chirurgia*, 940, No. 1, p. 80.

The evaluation of a group of 377 cases selected from the literature reveals that femoral hernias occur primarily in women (57%) and in the later years of life (38% patients are over forty years of age). Childbearing and strenuous physical work is its development. The right side is more frequently affected (77 times) than the left (93 times) and bilateral involvement is rare. Strangulation of the contents occurs more frequently in femoral than in inguinal hernia. Analysis of this series showing 55 (55 per cent) to be strangulated, 74 (67 per cent) irreducible and only 48 (7.3 per cent) reducible. By comparison with statistics of the "Time before the Revolution," it is evident that strangulation is now correctly diagnosed and brought to operation much earlier than formerly. Operation was done on 70.3 per cent of the patients within the first twenty-four hours and on 45.3 per cent within the first twelve hours after the onset of symptoms.

Operation was performed on 269 patients, for the most part (93 per cent) under local anesthesia and by the simple method of herniotomy (83 per cent). By this means the carefully isolated hernial sac was ligated as high as possible, after replacement of its contents, and the stump was buried in the abdominal cavity. The hernial ring was closed by

means of three or four sutures between Poupart's ligament and the pectineal fascia. It was necessary to resect intestines eleven times and omentum thirty six times. Wound suppuration (29 cases) was observed following operation twice as often in strangulated hernias (20) as in "free" hernias. The type of hernia not only influences wound healing but it affects the incidence of recurrence. One hundred and thirty-five patients could be traced from one to ten years after operation and among them were 15 recurrences (11.1 per cent), of these 2 were scarcely avoidable because of technical difficulties at the time of operation (extensive intestinal resection and tamponade having been necessary). The remaining 13 recurrences were found among the 127 cases which had been operated upon by the "simple method." There were 3 deaths, all of patients with incarcerated femoral hernias which were reduced. One death was due to peritonitis, it occurred in a patient operated upon two days after strangulation, 2 deaths were due to circulatory failure. Both of these patients were operated upon on the sixth day after hernial strangulation and both were well over sixty years of age.

In conclusion, the operation of Ruggi-Parlavacchio for femoral hernia is subjected to a critical discussion and is rejected as the procedure of choice. This operation was performed in 14 cases and 8 of the patients were traced and found without recurrence, however, 1 patient had developed a large inguinal hernia. The author believes that such a technically difficult procedure should be restricted to the exceptional case. (SCHÖBER) JOHN L. LINDBQUIST, M.D.

Shelley, H. J. Femoral Hernias. A Study of 238 Hernias and 226 Repairs. *Arch Surg*, 1940, 41: 1229

Included in this study were 238 femoral hernias. They comprised 5.35 per cent of the total group of all types of hernias seen in the wards in the period covered by this study. Among these, femoral hernias not previously repaired numbered 222, and 210 of these were repaired by operation. One hundred and forty were examined postoperatively for nine months or longer or until a recurrence was discovered. Only 5 recurrences developed, which gave a recurrence rate of 3.6 per cent.

The remaining 16 femoral hernias were recurrent, following a previous repair. All 16 were operated on. Thirteen were followed up for nine months or longer, 2 recurrences were discovered, a recurrence rate of 15.4 per cent.

The period covered by this study was from 1916 to 1935, inclusive. All femoral hernias in patients admitted to the wards at St. Luke's Hospital, New York, from 1926 to 1935, and all hernias of this type repaired in the ten-year period from 1916 to 1925 in patients who returned for follow-up examinations over periods of nine months or longer, or until a recurrence was discovered, were included.

The operative mortality was 4.9 per cent (as compared to 0.52 per cent in incomplete indirect

inguinal hernias) and was due to 7 deaths, all following repairs of strangulated hernias. One death followed the repair of 16 recurrent femoral hernias, a mortality rate of 6.3 per cent.

Primary hernias. Of the 222 femoral hernias studied, 12 were not repaired. There were 7 operative deaths, and 34 patients did not return for follow-up examination. One hundred and forty were followed up for nine months or longer, for an average period of twenty-four and nine-tenths months. Only 5 recurrences were discovered, an incidence of 3.6 per cent. The average postoperative time at which the recurrences were first noted was twenty-six and eight-tenths months.

A total of 170 patients were examined in the follow-up clinic. The average follow-up time for all was twenty-one and two-tenths months. The recurrence rate calculated on all follow-up examinations was 2.9 per cent.

Recurrent hernias. All of the 16 patients with recurrent femoral hernias were operated on. One died postoperatively. Thirteen of the remaining 15 were followed up for nine months or longer. The average follow-up period was thirty-three and two-tenths months. Two recurrences were discovered, which gave a recurrence rate of 15.4 per cent. The average postoperative time at which these recurrences were discovered was ten months.

Fourteen patients altogether were examined in the follow-up clinic. The average follow-up time was thirty and one-tenth months and the recurrence rate was 14.3 per cent.

The author also discusses the operative technique of femoral hernioplasty. He states that with careful, intelligent surgical handling, satisfactory results will ensue whatever the method of repair. The use of silk throughout for suture and ligature material is recommended as a distinct improvement over the use of catgut.

Patients in whom a recurrent femoral hernia has been repaired should be kept in bed longer than those with primary repair. The additional time is to be determined by the nature of the repair required in each individual case. SAMUEL H. KLEIN, M.D.

GASTRO-INTESTINAL TRACT

Ruffin, J. M., and Brown, I. W., Jr. The Effect of Inflation of the Stomach Upon the Gastroscopic Picture. *Am J Digest Dis*, 1940, 7: 418

A critical analysis of 543 gastroscopic examinations done at Duke Hospital revealed that hypertrophic folds, or a cobblestone mucosa, was seen in only 3.9 per cent of the cases, as contrasted to Schindler's report of hypertrophic gastritis in 17.2 per cent of the cases studied by him. This discrepancy could not be explained by the essayists until about a year ago when they found that the large folds interpreted as hypertrophic gastritis would become normal or even completely defaced by inflation. It was noted that in every case the large and apparently swollen folds became normal

or flattened merely by inflation with it that normal folds tended to disappear and in a few cases blood vessels were to be seen where an apparently normal mucosa had been observed previously. These findings are beautifully illustrated in the original article by excellent, colored drawings and substantiate the authors' reports on findings.

An experimental study upon the alteration of the gastric mucosa by inflation was then done both in dogs and in man. In the dog it was found that the normal folds could be effaced at an average pressure of 4 cm. of water and at this pressure the picture was "indistinguishable from that which had been described as being characteristic of atrophic gastritis. I mean it was found that the folds were effaced at an average pressure of 2 cm. of water. There is no doubt that folds which seem large, often, and inflated when the instrument is first introduced may appear entirely normal after slight inflation and can usually but not always be obliterated completely by further inflation.

In some patients folds which appeared normal have disappeared under inflation and a typical picture of atrophic gastritis with visible blood vessels has presented itself. All this raises the question whether the folds are actually smaller or whether the change in the picture is due to the greater distance of the instrument from the objective and therefore a difference in magnification. This question is difficult to answer because when the stomach is inflated the mucosa is presumably much further away from the instrument with resulting smaller image.

The authors believe that hypertrophic gastritis is, at least in North Carolina, rarely seen. They also wish to change our concept on atrophic gastritis. They state that it should be described as an atrophy of the gastric mucosa. It is possible that an apparent atrophy is due to lack of tone in the gastric musculature and the restoration of tone results in normal gastroscopic picture. Their final conclusion is that the diagnosis of chronic gastritis by means of the gastroscopic picture should be the subject of further investigation and critical study.

SAMUEL J. FOGELSON, M.D.

Sebastiane III, A., and Gigante, D. Microscopic Examination of the Gastric Juice in the Secretory Changes and in Some Affections of the Stomach. (*L'esame microscopico del succo gastrico nelle alterazioni secretive in alcune malattie dello stomaco*). *Minerva med.*, 1943, 3, 393.

After reporting the results obtained by different authors in the microscopic examination of the gastric sediment, Sebastiane III and Gigante try to establish whether this procedure may offer some clues in the diagnosis of gastric affections and whether some affections show characteristic microscopic picture. Further the authors deal with the morphology and significance of the kermes usually found in the sediment cells, bacterial flora, amorphous detritus and mucus.

With regard to the degree of acidity of the gastric juice the patients (about 60) were divided into four groups: (1) those with normal acidity; (2) those with achlorhydria; (3) those with hypo-acidity; (4) those with hyperacidity.

In the first group are 4 subjects showing, after histamine stimulation, free hydrochloric acid from 40 to 50 and total acidity from 60 to 70. In the sediment a few epithelial cells, some bacteria, and rare leucocytes were observed. In some cells the nucleus and protoplasm are perfectly normal, twice as many however showed degenerative changes. In only 3 cases a low moderate or large number of leucocytes was found. Normal acidity does not mean normal mucous membrane: in many inflammatory ulcers, and neoplastic affections the amount of hydrochloric acid in the gastric juice may be normal.

In all cases of this group the cells were unchanged. The number of bacteria and leucocytes was not always increased; this could be due to the fact that in some cases this affection is of a purely functional order. 3 of 6 of the authors' cases many bacteria of different kinds and only a few leucocytes were found. A helpful indication for the microscopic diagnosis of achylia is the perfect integrity of the nucleus and protoplasm of the cells.

The features of the cells in these cases are extremely according to the degree of hypo-acidity. In some cases they appeared to be like those in normal conditions (3 of 4) in others like those observed in anaclorhydric patients.

In this group (8 cases) there were constant signs: the presence of much amorphous detritus and considerable degenerative changes in the epithelial cells. The protoplasm could hardly be recognized and the nucleus was deeply affected. The number of bacteria and leucocytes, as in some cases increased, in others diminished. The degree of acidity is therefore not the only factor in gastric microbial sterility.

From the results reported in the literature and from observations of their own, the authors draw some conclusions. It seems that the microscopic picture of the sediment may be helpful for the understanding of the type of the gastric acid secretion. Achlorhydria may be diagnosed when the cells are normal and the bacterial flora abundant. When the cells are reduced to the nucleus, which often degenerated, and there is little flora, excess acidity is present. The number of leucocytes does not give any indication of the degree of acidity but it is a safe criterion for the diagnosis of gastritis.

The initial stage of gastritis atrophy shows greatly according to the authors, rich bacterial flora and small number of leucocytes. In atrophic processes rich bacterial flora and large number of leucocytes are usually but not always observed. Red blood cells are constantly present but are not characteristic of these conditions alone. Neoplastic cells are rarely found. Eosinophilic leucocytes are only exceptional.

ALFRED CAVERT

Carter, B N, Stevenson, J, and Abbott, O A
 Transpleural Esophagogastrostomy for Carcinoma of the Esophagus and for Carcinoma of the Cardiac Portion of the Stomach *Surgery*, 1940, 8 587

In the instances in which it can be accomplished, the resection of the lower end of the esophagus, of a portion of the cardiac end of the stomach, or of portions of both followed by esophagogastrostomy offers the most satisfactory method of dealing with carcinoma in these areas. By this procedure the growth can be extirpated and the continuity of the stomach and esophagus restored in one stage, and thus the necessity for the formation of antethoracic skin tubes or for the use of rubber tubes to allow the act of swallowing to be completed is avoided. This operation should have a wide field of usefulness in view of the fact that from 33 to 50 per cent of all carcinomas of the esophagus are said to occur in the lower third of this organ and about 10 per cent of all those in the stomach occur at the cardia.

The approach to lesions in the cardiac end of the stomach and in the lower end of the esophagus is easier when carried out through the chest than when attempted through the abdomen. After a preliminary artificial pneumothorax has been induced, the thorax can be safely opened through an intercostal incision in the seventh or eighth interspace and an excellent exposure of the terminal third of the esophagus and diaphragm can be obtained. When the diaphragm has been widely opened from the esophageal hiatus to the costal margin, an easy access is afforded to the entire stomach, spleen, and a portion of the liver. The stomach can be readily mobilized, as can the lower half of the esophagus, and, after portions of them have been resected, the anastomosis can be completed under direct vision without the need of working down in a small, dark wound. If the wound edges are protected, and the pleural cavity is packed off with sponges, there is little danger of empyema due to soiling of the pleural cavity. Empyema follows leakage at the line of anastomosis rather than soiling at the time of operation.

The majority of the failures of the methods which have been used in the past have been due to two causes, viz, shock and leakage at the suture line. With the improved technique of operating, with better methods of anesthesia, with the recognition of the importance of pre-operative pneumothorax, and with the increased use of blood transfusions, the danger from shock has practically disappeared and can now be placed at a minimum. The most potent cause for leakage at the suture line has been tension on the line of anastomosis. The authors have attempted to obviate tension in two ways: first, by anchoring the stomach to the periosteum of a nearby rib in such a way as to remove any pull or drag on the point of anastomosis, and, second, by stitching the diaphragm well down on the stomach, rather than close to the line of suture between the stomach

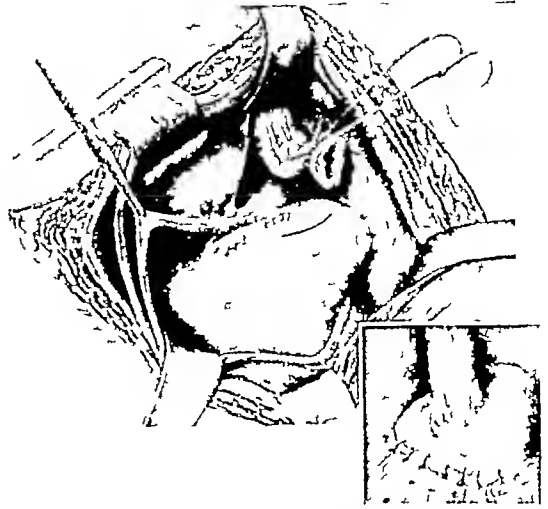


Fig 1 The growth in the esophagus has been resected along with a portion of the stomach. The stomach has been closed. The solid line on the stomach shows the line of the incision in the fundus through which the end of the esophagus was introduced. The end of the esophagus has been closed with a purse string suture of No. 00 catgut, the ends of which were left long and used to pull the esophageal stump well down into the stomach, while the latter was sutured around the esophagus. The insert shows the completed anastomosis. Note the sutures which attach the stomach to the periosteum of the seventh rib.

and the esophagus. Recently in some experimental work the authors have anchored both the stomach and the esophagus to the chest wall (periosteum of the rib or of a vertebral body) so that the line of anastomosis between the stomach and the esophagus can actually be displaced from side to side and from above down without the least pull on it. They believe that this is a most important point in the technique and that by utilizing it one can completely avoid tension. The rent in the diaphragm through which the stomach has been brought into the thorax must be partially closed and the edges of the diaphragm then sutured to the stomach in order to prevent herniation of the intestine through the diaphragm. When the diaphragm is sewed to the stomach, care must be taken to attach it well down toward the greater curvature so as to place plenty of stomach in the thorax. The tendency is to stitch it too close to the anastomosis and thus create a drag on it.

In the 2 cases reported by the authors in this paper, the stomach was securely anchored to the periosteum of a nearby rib, after the anastomosis had been finished, with four sutures of silk (Fig 1). The end-to-side anastomoses between the stomach and esophagus were not done aseptically, but, since there was no leakage at the suture line, the pleura was able to cope with the small amount of soiling and no empyema resulted in either case. In both in

stances the wound in the chest wall healed per primam. Gastrostomy had been done in each instance weeks or months before the actual anastomosis between the stomach and esophagus was performed. In spite of this the stomach could be mobilized well enough to allow a sufficient portion of it to be pulled past the chest to reach the esophagus without tension.

One patient who was operated upon in May 1939, is alive and apparently well. The other patient died ten months after operation and, though no cause could be found at autopsy for her death, it must have been related to a stricture at the site of anastomosis which developed after operation.

The type of esophagogastrostomy in which the end of the esophagus is introduced into the stomach through a slit in the latter was used in both cases herewith reported, but it is not to be recommended. Stricture followed in each of the cases in which this type of anastomosis was performed.

The use of continuous suction in the esophagus after esophagogastrostomy is of advantage in relieving pressure on the suture line by removing the accumulated secretions and by keeping esophageal peristalsis at minimum. JOSEPH K. VARR, M.D.

Macleod, J. G., and Baird, R. R. Carcinoma of the Stomach in Young Subjects. *Edinburgh M J* 940, 47, 627

Three cases of carcinoma of the stomach occurring in persons thirty years of age or under are recently admitted to the wards of the Royal Infirmary Edinburgh. During the period from January 1934, to January 1940, approximately 700 cases of gastric cancer were treated in the same institution. Among this number 7 more instances of cancer of the stomach in persons of thirty years of age or under were observed, which made total of 14 cases in all.

Bruckner in 1936 discussing carcinoma of the stomach in young people found that males tended to be affected twice as frequently as females. The tumors were usually medullary less commonly scirrhous, and the pyloric antrum as the usual site. Phillip's analysis (1939) based on a series of 60 cases of stomach cancer in persons of thirty years of age or under which were observed at the Mayo Clinic, was made over a period of thirty years. Ninety of the patients had carcinoma. The lesion involved the lesser curvature in 26 instances, the pyloric antrum in 24, the entire stomach in 9, the pylorus in 9, the greater curvature in 8, the cardio-esophageal region in 6, and the middle third of the stomach in 4.

Bruckner stated that the disease most commonly simulated peptic ulcer. The illness was characterized by sudden onset, rapid course, persistent fever and progressive anemia. Free hydrochloric acid was commonly present, but an abdominal mass was infrequently felt. The outlook was hopeless, no patient having lived longer than three years.

The three series, admittedly small, differs from the series described in the following features:

Six of the 10 cases occurred in women. Histological confirmation obtained in 6 instances, showed 4 adenocarcinomas, 1 case of scirrhous, and 1 of medullary carcinoma. The pyloric antrum was involved in 8 cases, the lesser curvature in 1 case and the entire stomach in 1 case. The characteristic course in 7 cases began with period of vague dyspepsia in which abdominal pain as a common feature. Vomiting was present in 9 cases and tended to be obstructive in type. Pyrexia was uncommon, it was present in only 1 instance. A mass, as from being infrequent, as palpable in 7 patients.

The average duration of symptoms prior to admission as fifteen and one half weeks. Local metastases were present in 9 patients. 1 of the 6 cases examined post-mortem, metastases were widely disseminated. The outcome as almost fatal.

Special emphasis should be laid upon the short course of the disease, the extensive metastases, and the hopeless prognosis in young individuals with carcinoma of the stomach. The condition, like uncommon, is not as rare as it is usually thought to be. Therefore the error of ruling out the diagnosis of stomach cancer on account of the youth of the patient who is suffering from an atypical type of dyspepsia, must be avoided. In such cases the routine use of the flexible gastrostome in hospital practice might enable a diagnosis to be made sufficiently early for the more fruitful exploitation of radical surgery. JOHN W. MERRILL, M.D.

Zastrowen, G. R. Small Carcinomatous Gastric Lesions Mimicking Chronic Benign Ulcer: Present Status of Differential Diagnosis and Treatment. *Minnesota Med J* 940, 3, 701.

Carcinoma in its earlier stages is still diagnosed too infrequently. Circumscribed innocent looking ulcerous gastric lesions may be actually or potentially malignant. Satisfactory differential diagnosis, in the absence of a specific biological test for carcinoma, is frequently impossible without recourse to microscopic examination of the lesion. On the basis of repeated clinical and pathological observations, certain diagnostic criteria of relative or absolute value in differential diagnosis have been evolved.

The typical benign ulcer is small, usually not exceeding 3 cm. in diameter and has certain familiar roentgenological characteristics. When the patient is thirty years of age or less, a small ulcerous lesion associated with 40 units of free hydrochloric acid in the gastric contents after the Ewald meal is usually benign. A concentration of free hydrochloric acid of 60 or more clinical units (Ewald) also strongly favors benignity. The benign nature of the lesion is also characterized by the permanent disappearance of all symptoms and signs following adequate medical treatment irrespective of age, nature or duration of symptoms, or site or location of the lesion.

Although about fifth of all malignant gastric lesions may be within the size range of benign ulcer (4 cm. or less in diameter) only 6.5 per cent of car-

nomas are small ones (2.5 cm or less). At least 5 per cent of the lesions unequivocally diagnosed in recent years by our roentgenologists as benign ulcers were actually carcinomatous. The meniscus complex for all practical considerations is pathognomonic of ulcerating carcinomas, irrespective of size. The roentgenological characteristics of carcinomatous ulcer are less definitive than the meniscus complex. Large niches are regarded with suspicion, but a large ulcer is not necessarily malignant. Other features suggestive of the possible malignant nature of the lesion are an elderly patient with a late onset of symptoms, the combination of histamine refractory achlorhydria and pyloric obstruction, persistent occult blood in the stool during and after treatment, incomplete response to adequate treatment, and situation of the lesion near the pylorus on the greater curvature, or posterior wall, as well as certain features elicited by the gastroscopic examination.

The presence of a gastric lesion, however small, makes imperative adequate medical treatment and observation, if exploratory operation is not undertaken. This applies in particular to the middle aged or elderly individual. Treatment is justifiable when the lesion is not frankly malignant as the majority of uncomplicated gastric ulcers heal readily under favorable conditions, and gastric resection, under average conditions, still carries a much higher mortality than the risk of death from carcinoma. The nature and degree of response to treatment are also important factors in the differential diagnosis.

Casberg, M. A. Perforation as a Complication of Gastric Carcinoma. *Arch Surg*, 1940, 41: 937.

Perusal of the medical literature impresses one with the infrequency of references to perforation as a complication of gastric carcinoma.

In a series of 247 proved gastric carcinomas admitted to the St. Louis City Hospital there were 7 which were complicated by acute perforation and generalized peritonitis. All of the perforations occurred in men. The average age of the patients in the entire group was sixty-three years, as compared with an average age of fifty-one years for the patients with perforation.

Two personal cases of perforated gastric carcinoma are presented in detail.

The differential diagnosis between gastric perforations due to carcinoma and those due to peptic ulcers is difficult if the patient is seen after perforation has occurred. The differential diagnosis depends not so much on the physical findings as on the past history.

Immediate exploratory laparotomy is the therapy of choice. Should shock complicate the picture, parenteral fluids, blood transfusions, and other combative methods must be used in an effort to prepare the patient for an early operation. Once the gastric lesion has been recognized and explored, further surgical steps must depend on the extent of the process and the condition of the patient. Ideally,

gastric malignant tumors should be resected, but in the great majority of cases the primary operation should be limited to closure of the perforation, resection being reserved for a later time, when the patient is better able to withstand it.

Technically, closure of a perforation due to a gastric cancer is more difficult than closure of one due to a peptic ulcer. The former is more friable and indurated and does not lend itself to repair with a purse-string suture or to other methods used in closure of a simple peptic ulcer. The simplest procedure is to cover the perforative site with a flap of greater omentum "tacked down" with interrupted absorbable sutures. After aspiration of the spilled gastric contents from the peritoneal cavity a rubber-dam drain should be introduced to the region of the perforation with exit through a stab wound in the upper part of the abdomen. Drainage is the procedure of choice in view of the fact that the latter cannot be closed with assurance that there will be no further leakage. Biopsy specimens should be taken from all perforating gastric ulcers.

JOSEPH K. NARAT, M.D.

Touroff, A. S. W., and Sussman, R. M. Congenital Prepyloric Membranous Obstruction in a Premature Infant. *Surgery*, 1940, 8: 739.

Exclusive of hypertrophic pyloric stenosis, congenital obstructions of the stomach are very rare.

The case of congenital prepyloric membranous obstruction reported is described in detail by Touroff and Sussman. The patient was a white female born approximately four weeks before term. The mother's pregnancy was complicated by marked polyhydramnios, and the only other pregnancy had produced a premature child that died three days after birth. The father had two sisters, each of whom bore a single child. Both children died in infancy, one of cerebral agenesis and the other of monogonism.

At birth the baby weighed 6 lbs. and presented no gross abnormalities. However, initial cyanosis was quite marked and responded to intensive treatment only after a five-hour period. No meconium was passed during or after delivery. Soon after being placed upon formula it presented symptoms of high obstruction. On the second day the urine was examined for bile and found positive. Roentgenograms taken on the fourth day were difficult to interpret, but presented evidence of an obstructive lesion in the distal portion of the stomach or very first portion of the duodenum. On the fifth day fairly deep jaundice was present, there was evidence of moderate dehydration, no spontaneous bowel movements or passage of even meconium had occurred, and enemas were not effectual.

Operation on the fifth postnatal day consisted of multiple incisions of the prepyloric septum and pyloroplasty (Fig. 1). No other congenital anomalies were found.

Postoperatively, periodic vomiting occurred during the first twenty-four hours, but the major portion



Fig. Operative findings and procedure. Hyper-trophied dilated antrum retracted toward the left, to expose duodenal and gastroduodenal junction. Note sharply demarcated pyloric ring and normal caliber of duodenum. Duodenum is elongated and rises sharply to reach head of pancreas. Entire liver displaced into right side of abdomen by distended stomach. Large bowels almost completely hidden. Small intestine empty and contracted. A, Cross section of antrum and adjacent duodenum showing site of mucous membrane septum in immediate prepyloric area. B, Incision through peritoneal portion of duodenum and adjacent stomach, C, incision about to be closed at right angles to its original direction (Heineke-Mikulicz pyloroplasty); D, pyloroplasty continued lower (confinuous) suture completed, outer tier of anastomotic suture being placed. Diagrammatic sketch of site and extent of incision.

of the feedings as retained. The vomitus contained bile which indicated patency at the operative site. The day after operation meconium and then stool were passed thereafter the bowels moved several times daily. For eighteen days the postoperative course was considered satisfactory. At this time moderately severe pharyngitis was present, and secondary complete intestinal obstruction developed. If ever five days later as operation as about to be performed, the obstruction as relieved spontaneously. After stormy course the patient was discharged five and one-half weeks after operation. Five months postoperatively x-ray studies revealed the gastro-intestinal tract to be normal except for rapid emptying of the stomach and intestinal hypermotility. Seventeen months after operation the child weighed 30 lbs and was entirely free of gastro-intestinal symptoms.

Touros and Susana report that this is the best of their knowledge this case is the first of its kind to be reported. It is one of the few successful attempts to

major surgery upon premature child and is the earliest pyloroplasty; also, it appears to be the earliest case of postoperative intestinal obstruction recorded.

EARL GARDNER, M.D.

Ask-Upmark, E.: On the Presence of Deficiency Factor in the Pathogenesis of Peptic Ulcer. *Acta Chirurg. Scand.* 940, 84, 55.

Among 7 cases of Addison disease in which the typical reports on the gastro-intestinal tract were complete, peptic ulcers were found. The author believes that the history of epigastric pain so common in Addison disease may indicate peptic ulcer. A long theoretical discussion leads the author to the following conclusions:

Addison disease and experimental adrenalectomy may be associated with peptic ulcer. This may be due to incomplete intestinal absorption of the nutrients. Peptic ulcer also occurs in disorders of the liver and in infectious disorders in which the consumption or destruction of nutrients may be abnormal. Peptic ulcer may also be encountered in Addison disease. The salient clinical features of the ulcer syndrome, such as seasonal periodicity, the benefit of adequate feeding, the aggravation by inadequate diet and the improvement by blood transfusion, may all be explained by the occurrence of a nutritional deficiency.

P. H. BRAZ, M.D.

Rivers, A. B., and Gardner, J. W. Recurrent Peptic Ulcer. *J. Am. Med. Assn.* 940, 5, 779.

This study includes 65 cases of postoperative recurring ulceration. The exact situation of both the primary and secondary lesions as ascertained by roentgenographic evidence. The situation of the secondary ulcerations was confirmed by direct inspection of the elements at operation. Only those cases were accepted for study in which the history included exact information regarding the syndrome under consideration.

An inquiry was made as to the situation, duration, and character of the pain, the time of its onset and mode of relief. A special attempt was made to compare the characteristics of the original lesion with those of the one which developed postoperatively. Ten types of operative procedure are included in this group.

Results of this study of secondary ulceration tend to confirm such impression as those which one of the authors (Rivers) previously expressed concerning the mechanism of the conduction of pain from peptic ulcerative lesions to the spinal cord. Uncomplicated peptic ulcer probably indicates its presence as a visceral phenomenon which asserts itself along the splanchnic nerves. Such route however does not satisfactorily explain the varying shifts of pain that occur when ulcers venture beyond the confines of the bowel. These shifts of pain probably can be explained better by reference to one of the other mechanisms which mechanisms could include either the phrenic path in the case of high-lying perforating gastric lesion, or root along the sensory

spinal nerves These nerves could be expected to produce a syndrome less rhythmic and clear-cut than the syndrome caused by uncomplicated ulcer, since they are sensitive to many stimuli in addition to the "adequate stimulus" producing pain over the splanchnic route

The situation of the majority of recurring peptic ulcerations is in or near the site of surgical anastomosis if operation has been performed The physical factor probably determines the site at which the ulcer will develop The site of the maximal force of impingement of the chyme decides the site of erosion The general characteristics of the symptoms of the recurring lesions are similar to those of the symptoms produced by the original lesions A majority of secondary ulcerations tend to penetrate deeply and, therefore, produce symptoms which are less intermittent, cause more distress at night, and are less easily relieved by food and alkali A great number of recurring lesions involve the site of surgical anastomosis with the production of more or less obstruction, which tends to distort somewhat the usual syndrome for ulcer The projecting pain of perforating peptic ulcers is in all probability the result of direct stimulation of the spinal sensory nerves which produces referred pain in the distribution of the more highly differentiating peripheral or cutaneous branches of these nerves When a gastric ulcer begins to produce pain in the tip of the shoulder, indicating use of the phrenic pathway, it can be assumed that deep penetration or active perforation has occurred

Schlicke, C P, Barga, J A, and Dixon, C F
Intestinal Obstruction, an Evaluation of Conservative Therapy *J Am M Ass*, 1940, 115 1471

This paper is a report of the results obtained from treatment in cases of intestinal obstruction encountered at the Mayo Clinic from August 1, 1938, to July 31, 1939, inclusive All types of obstruction are included acute, chronic, simple, and strangulated, in both the large and small bowel The chief purpose of this review is to obtain a broader and more inclusive evaluation of conservative therapy

All cases were divided into two main groups (after the method of Wangenstein) simple obstructions and strangulation obstructions There were 133 of the former and 33 of the latter, a total of 166 cases The most common single cause of simple obstruction was carcinoma of the sigmoid or rectosigmoid, post-operative adhesions occupied second place

In this study we have graded all simple obstructions as of high, medium, or low grade This grading was arbitrary, independent of the site of obstruction, and determined on the basis of (1) the degree of distention, (2) the amount, duration, and character of the vomiting, (3) the duration and degree of obstruction, (4) the evidence obtained from a simple roentgenogram of the abdomen, (5) alterations in the blood chemistry, and (6) the amount of colic and the character of peristalsis

A search was made to determine if there were any factors responsible for the recurrence of attacks of obstruction or the exacerbation of attacks already in progress which could be avoided It was found that in 22 (16.5 per cent) of 133 cases of simple obstruction, the precipitation of an attack of obstruction (16.5 per cent) was caused by the administration of barium or too violent purgation, and in an additional 5 cases (3.8 per cent) barium seemed to be a factor in the precipitation of an obstruction

Penberthy, G C, Irvin, J L, and Tenery, R M
Fluid, Salt, and Nutritional Balance in Patients with Intestinal Suction Drainage *Ann Surg*, 1940, 112 530

The problem of fluid, mineral, and nutritional balance in patients during gastro intestinal suction has been of great interest and caused much concern All authors agree that during suction drainage there is great need for careful attention to the fluid and salt balance and they indicate that the maintenance of this balance may be effected only by the parenteral administration of fluids

The authors claim that since the introduction of balloon-tipped tubes, the oral administration of fluids is more practical and in most cases maintains the fluid and mineral balance without the need of venous infusions Four patients were studied In this study the oral intake, as compared with the aspirated fluid in all cases, revealed that varying amounts of food, fluid, and salt were utilized by the patient despite constant suction drainage It is only because of the greater absorbing surface afforded by the length of intestine above the tube tip that low ileal drainage affords better possibilities for oral feedings However, during the early period of intubation, before the distention is controlled, parenteral fluids are imperative, since usually the patient not only fails to absorb fluid, but loses excessive fluids and salt from the gastro intestinal tract

The sodium and potassium balances are fairly well maintained by the oral intake

The data presented by the authors indicate that in patients with low ileal drainage it is possible to maintain good fluid, salt, and nutritional balance if the patient ingests a sufficiently larger quantity of food, salt, and fluid than is removed by suction However, even in cases with drainage from the lower ileum this should not be relied upon entirely When suction is exerted at higher levels it is much more difficult if not impossible to maintain good balances, especially with regard to salt The parenteral administration of fluids in conjunction with oral intake in excess of suction is important

HOWARD A. McKNIGHT, M D

Toyidzé, S S Ligation and Thrombosis of Veins of Large Intestines *Vestnik khir*, 1940, 59 622

The author studied the rôle of the collateral circulation in thrombosis of the veins of the large intestines or after their ligation, with special attention to anastomoses between the portal system and that of

the vena cava inferior. The veins of the large intestines were selected for the study because the aforementioned anastomoses are particularly well developed in this portion of the digestive tract.

Three series of experiments were performed. (1) ligation of the ileocolic, right and median colic, and caudal mesenteric veins. (2) ligation of the aforementioned veins and production in them of thrombi by injections of from 5 to 4.0 c.c.m. of 30 per cent sodium chloride solution and (3) production of similar thrombosis in the minor veins of the large intestines in the aforementioned manner by injecting the thrombosing solution into the isolated trunk of the caudal mesenteric vein. All experiments were performed on dogs.

The author draws the following conclusions:

Ligation of the main veins of the large intestines produces signs of congestion, such as cyanosis or edema of the intestinal wall. These symptoms gradually subside and completely disappear after five days. The efferent collateral pathways are as follows: (1) portocaval anastomoses, (2) anastomoses between branches of the portal vein, and (3) the intramural venous reticulum. The first-mentioned structures are located in the region of the distal portion of the gut and represent the major part of all anastomoses, while connections between branches of the portal vein are less numerous and confined chiefly to the proximal portion of the large intestines. Ligation or thrombosis of the main venous trunks of the large intestines leads to various pathological changes in the intestinal wall, which depend on the development of the collateral circulation. In the proximal portion of the gut with scanty anastomoses, venous thrombosis is followed by grave pathological changes in the form of ulcers or infarcts, while in the distal segment such serious lesions are relatively rare. More frequently a cyanosis, edema, mucous degeneration, or punctiform petechiae in the mucosa develop; they completely subside after from twenty-two to twenty-four days.

Thrombosis of minor veins and the intramural venous network is accompanied by grave pathological lesions such as erosions, ulcers, or infarcts.

Serious pathological changes in the large intestines following venous thrombosis lead to intestinal hemorrhages and weakness of the animal. Hemorrhages from ulcers gradually lose their intensity and stop completely after three or four days. They are more intensive if they are sequelae of infarcts and may prove fatal from fifteen to thirty-six hours after the operation.

Postoperative intestinal hemorrhages in man may be attributed to an interference with the return flow of the venous blood from the large intestines, as result of venous thrombosis.

Ligation of the veins of the large intestines or their thrombosis, following resection of the large intestines or a colostomy interferes with the return flow of the blood and may lead to necrosis of the intestinal wall and disruption of its margins after separation of the sutures. JOSEPH K. NAY, M.D.

Broders, A. C., Baile, L. A., and Laird, D. R. The Progression in Carcinoma of the Rectum. *J. M.* 1919, 940, 5, 666.

Four hundred and thirty-four resected specimens of carcinoma of the rectum were graded and grouped according to Broders' and Dukes' classifications. The distributions of grade and class were studied in comparison with other investigations, and also a relationship to survival after operation. On the basis of the entire study certain conclusions were reached:

1. The presence or absence of mucus does improve as a guide to prognosis if histological grading is done by Broders' method.

Tumors of higher grades are more rapid in growth and their metastases cause the death of the patient earlier than those of lower grades.

3. The classification of the lesion according to Dukes is also correlated with postoperative life, the higher the class, the less the percentage survival.

4. A combination of both Broders' grading and Dukes' classification yields a prognosis of survival more accurate than either method taken separately.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Bonn, H. K., and Bachhuber, C. A. The Surgical Treatment of Acute Cholecystitis. *Am. J. Surg.* 1919, 49, 447.

In this survey of all biliary cases admitted to the Los Angeles County Hospital for the five-year period from 1913 to 1918, an attempt is made to determine the relationship between the complications and the mortality of acute cholecystitis, and the elapsed time from the onset of symptoms to the time of operation. The pathological diagnosis rather than the operative report is used as a criterion in all cases in which cholecystectomy was done.

During this period there were 935 patients admitted with diagnosis of biliary disease; of the entire group, 704 operations were performed. Acute cholecystitis was diagnosed in 5 patients, but 6 cases are excluded because of insufficient data; this leaves 215. None of this group was operated upon, either because the patient refused or the surgeon objected. There were 15 deaths in this non-operative group, a mortality of 6 per cent. Nine autopsies were done and in all but two instances the cause of death was other than acute cholecystitis or its complications. All autopsies showed the presence of cholecystitis. Since 30 of these patients apparently recovered and were discharged in from five to fourteen days, it would appear that the incidence of perforation, gangrene, and necrosis may not be so high as some observers report.

The operative cases are tabulated in three groups. Group I includes the patients operated upon within forty-eight hours of the onset of illness. Group II, those operated upon from the third to sixth day after the onset and Group III, those operated upon after the sixth day.

In Group I there were 16 cases with 3 deaths, a mortality of 19 per cent. There were 5 cholecystectomies in females with no deaths, and 3 in males with 1 death. The pathological diagnoses were as follows: 2 cases of subacute and 1 case of marked subacute cholecystitis, 1 case of empyema, 1 case of gangrene, and 3 cases of chronic cholecystitis. There were 8 cholecystostomies which were evenly divided as to sex. There were 2 deaths, a male and a female. One case of hydrops and 1 of empyema were included.

In Group II there were 64 cases with 5 deaths, a mortality of 8 per cent. Forty-eight cholecystectomies were done, with 4 deaths, a mortality of 8.3 per cent. There were 36 in females (2 deaths) and 12 in males (2 deaths). The pathological diagnoses were: 7 acute, 9 subacute, 5 ulcerative, and 2 gangrenous cases of cholecystitis, 1 case with hydrops, and 24 cases of chronic cholecystitis. Sixteen cholecystostomies were done with 1 death, a mortality of 6.2 per cent. In 11 females there were no deaths. The pathology was given as 1 case of subacute and 1 of gangrenous cholecystitis and 1 case with empyema. In the 5 males there was 1 death.

In Group III there were 427 cases with 23 deaths, a mortality of 5.4 per cent. There were 390 cholecystectomies with 20 deaths, a mortality of 5.1 per cent. In this group 311 of the patients were females (13 deaths). The pathological diagnoses in these 311 cases included: 8 cases of acute, 58 of subacute, and 208 of chronic cholecystitis, 1 case with cholesterosis, 1 with gangrene, and 1 with hydrops, and 4 of purulent, and 21 of ulcerative cholecystitis. No report was given in 10 instances. There were 79 cholecystectomies in males, with 7 deaths. Three cases of cholecystitis were acute, 18 subacute, 45 chronic, 1 case presented empyema and 1 gangrene, and 7 were ulcerative. No report was given in 4 cases. Thirty-seven cholecystostomies were done, 27 in females and 10 in males, with 3 deaths, a mortality of 8.1 per cent. There was 1 death in a female. Three empyemas were included. In the 10 males, 2 deaths occurred. One case of gangrene, 2 cases of perforation, 3 of empyema, and 3 of chronic cholecystitis made up this series.

The authors point out that Group I is too small a series to have positive value. In Group II almost a third of the patients showed subsidence of the pathology, but considerable acute pathology remained in the other patients, yet the mortality was considerably lower than that in Group I. In Group III minimal clinical manifestations were present at the time of operation, yet acute lesions were present in 31 per cent of the patients. The mortality, however, dropped to 5.4 per cent.

The authors believe that operation within forty-eight hours carries too high a mortality to warrant much consideration, especially in their own hospital, which is a charity institution. They believe that no absolute time can be set as the optimum for operation. Advanced pathology may be present with minimal clinical signs. Except for perforation and

gangrene, which may occur at any and all times, the mortality will be lowest when operation is done late.

JOHN L. LINDBQUIST, M.D.

Macdonald, D. Postoperative Perfusion of the Biliary Ductal System. *Canadian M. Ass. J.*, 1940, 43: 411.

The author reports a new postoperative method of cleansing the biliary ducts, and of application of thermostatically controlled heat to the interior of the biliary tract.

Since cholecystectomy does not remove all the pathological changes in biliary-tract disease, an effort to produce a normal duct system should be made in selected cases. This can be done by using a common-duct drain or gall-bladder-stump drain as part of a perfusion apparatus, which should result in a reduction of the incidence of postoperative symptoms.

On the tenth or twelfth postoperative day, following medication designed to relax the sphincter of Oddi (olive oil, magnesium sulfate, amyl nitrite, or glyceryl trinitrate), the ducts are perfused with heated (from 110 to 115° F.) saline solution, antiseptics, or solvents by means of a continuous intravenous apparatus for from thirty to forty-five minutes. No morphine is given. The pressure is controlled by the height of the fluid level. The jar containing the perfusing fluid can be enclosed in a water jacket so that the fluid can be heated to any desired temperature. The procedure can be performed easily by the patient at home. A cholangiogram should always be made before perfusion, because of the danger of impacting a calculus by irrigation.

In favor of the new method are the facts that drainage is "down hill" along natural anatomical routes, rather than "uphill" as in T-tube or gall-bladder drainage, that the intrahepatic ducts can be cleansed and heat applied to their interior, that the patency of the bile passages is preserved, that the thorough and complete drainage of the ducts should theoretically diminish the incidence of pancreatitis, that slow dilatation of the sphincter is produced, which decreases the likelihood of postoperative colic and that the procedure can be fully evaluated by examination of the washings collected through a duodenal tube.

S. LLOYD TEITELMAN, M.D.

Bresnihan, P. Experimental Study of the Pathogenesis of Acute Necrosis of the Pancreas (Experimente zur Pathogenese der akuten Pankreasnekrose). *Beitr. z. path. Anat. u. z. allg. Path.*, 1939, 102: 424.

After a short collective review of the literature, the author describes animal experiments conducted for an investigation of the causes of acute necrosis of the pancreas. He proceeds from the theory of Chiari, according to which the cause of acute necrosis of the pancreas is to be found in an overflow of bile into the pancreatic duct. The two pancreatic ducts in dogs were therefore connected with the biliary tract by

the vena cava inferior. The veins of the large intestines were selected for the study because the aforementioned anastomoses are particularly well developed in this portion of the digestive tract.

Three series of experiments were performed: (1) ligation of the ileocecalocolic, right and median colic, and caudal mesenteric veins; (2) ligation of the aforementioned veins and production in them of thrombi by injections of from 5 to 4 c.c.m. of a 3 per cent sodium chloride solution; and (3) production of a similar thrombosis in the minor veins of the large intestines in the aforementioned manner by injecting the thrombosing solution into the isolated trunk of the caudal mesenteric vein. All experiments were performed on dogs.

The author draws the following conclusions:

Ligation of the main veins of the large intestines produces signs of congestion, such as cyanosis or edema of the intestinal wall. These symptoms gradually subside and completely disappear after five days. The efferent collateral pathways are as follows: (1) portocaval anastomoses; (2) anastomoses between branches of the portal vein; and (3) the intramural venous reticulum. The first mentioned structures are located in the region of the distal portion of the gut and represent the major part of all anastomoses, while connections between branches of the portal vein are less numerous and confined chiefly to the proximal portion of the large intestines. Ligation of thrombosis of the main venous trunks of the large intestines leads to various pathological changes in the intestinal wall, which depend on the development of the collateral circulation. In the proximal portion of the gut, with acute anastomoses, venous thrombosis is followed by grave pathological changes in the form of ulcers or infarcts, while in the distal segment such serious lesions are relatively rare. More frequently cyanosis, edema, mucous degeneration, or punctiform petechiae in the mucosa develop; they completely subside after from twenty-two to twenty-four days.

Thrombosis of minor veins and the intramural venous network is accompanied by grave pathological lesions such as erosions, ulcers, or infarcts.

Serious pathological changes in the large intestines following venous thrombosis lead to intestinal hemorrhages and weakness of the animal. Hemorrhages from ulcers gradually lose their intensity and stop completely after three or four days. They are more intensive if they are sequels of infarcts and may prove fatal from fifteen to thirty-six hours after the operation.

Postoperative intestinal hemorrhages in man may be attributed to an interference with the return flow of the venous blood from the large intestines, as result of venous thrombosis.

Ligation of the veins of the large intestines or their thrombosis, following resection of the large intestines or a colostomy, interferes with the return flow of the blood and may lead to necrosis of the intestinal wall and disruption of its margins after separation of the sutures. JOURNAL K. S. A. M. D.

Broders, A. C., Bale, L. A., and Laird, D. E.: The Prognosis in Carcinoma of the Rectum. *J. A. M. Ass.*, p. 49, 5 1936.

Four hundred and thirty-six resected specimens of carcinoma of the rectum were graded and grouped according to Broders and Dukes' classification. The distributions of grade and class were studied in comparison with other investigations, and also a relationship to survival after operation. On the basis of the entire study certain conclusions are reached:

1. The presence or absence of mucus loses importance as a guide to prognosis if histological grading is done by Broders' method.

2. Tumors of higher grades are more rapid in growth and their metastases cause the death of the patient earlier than those of lower grades.

3. The classification of the lesion according to Dukes is also correlated with postoperative life; the higher the class, the less the percentage survival.

4. A combination of both Broders' grading and Dukes' classification yields a prognosis of survival more accurate than either method taken separately.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Benn, H. K., and Bachhuber, C. A.: The Surgical Treatment of Acute Cholecystitis. *A. J. Surg.* 1944, 49, 417.

In this survey of all biliary cases admitted to the Los Angeles County Hospital for the five-year period from 1931 to 1938, an attempt is made to determine the relationship between the complications and the mortality of acute cholecystitis and the elapsed time from the onset of symptoms to the time of operation. The pathological diagnosis rather than the operative report was used as criterion in all cases in which cholecystectomy was done.

During this period there were 933 patients admitted with a diagnosis of biliary disease. Of the entire group, 704 operations were performed. Acute cholecystitis was diagnosed in 25 patients, but 6 cases are excluded because of insufficient data; this leaves 245. None of this group was operated upon, either because the patient refused or the surgeon objected. There were 3 deaths in this non-operative group, a mortality of 6 per cent. Autopsies are done and in all but instances the cause of death was other than acute cholecystitis or its complications. All autopsies showed the presence of cholecystitis. Since 30 of these patients apparently recovered and were discharged in from five to fourteen days, it could appear that the incidence of perforation, gangrene or necrosis may not be so high as some observers report.

The operative cases are tabulated in three groups. Group I includes the patients operated upon within forty-eight hours of the onset of illness. Group II, those operated upon from the third to sixth day after the onset. And Group III, those operated upon after the sixth day.

In Group I there were 16 cases with 3 deaths, a mortality of 19 per cent. There were 5 cholecystectomies in females with no deaths, and 3 in males with 1 death. The pathological diagnoses were as follows: 2 cases of subacute and 1 case of marked subacute cholecystitis, 1 case of empyema, 1 case of gangrene, and 3 cases of chronic cholecystitis. There were 8 cholecystostomies which were evenly divided as to sex. There were 2 deaths, a male and a female. One case of hydrops and 1 of empyema were included.

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After a short collective review of the literature, the author describes animal experiments conducted for an investigation of the causes of acute necrosis of the pancreas. He proceeds from the theory of Chiari, according to which the cause of acute necrosis of the pancreas is to be found in an overflow of bile into the pancreatic duct. The two pancreatic ducts in dogs were therefore connected with the biliary tract by

means of specially constructed glass and rubber cannulae which made possible an influx of bile into the pancreas. In 6 of 5 cases the experiment succeeded, i.e., the cannula remained in the ducts up to the time of death or sacrifice of the animal. All these cases showed macroscopic as well as histological evidence of more or less extensive necroses of the pancreas. The picture corresponded exactly to that seen in human pathology.

In the control experiments as well as in cases in which the operation or experiment did not succeed, no signs of pancreatic necrosis could be demonstrated. It was therefore concluded that the establishment of a communication between the biliary and pancreatic ducts presented the prerequisite for development of acute pancreatic necrosis.

From the results of the experiments, and on the basis of further control experiments, in which the bile was injected into the free abdominal cavity it was concluded that the fatty tissue necrosis as not produced by bile which had passed via the pancreas into the abdominal cavity. Rather the passage of pancreatic juice into the abdominal cavity and the action of its lipolytic ferment upon the fatty tissue of the abdominal cavity was regarded as the cause of the fatty tissue necroses. As for the cause of the pancreatic changes themselves, the effect of the activated pancreatic ferment constitutes the determining factor although the pancreas did not remain sterile in all animals. Such an interpretation is indicated by the histological findings (regular hemorrhagic inflammation bile that following the injection of activated trypsin into the lumen as well as by the fact that pancreatic necrosis developed more rapidly in animals receiving injections of hypophysis after operation.

Finally attention is drawn to the analogy between the experimental results and the conditions in human pathology in which the picture of acute pancreatic necrosis may develop in calculous obstruction of the Vater papilla with persistence of communication between the two tracts.

(WILCKER): EDITH SCHLANGE MOORE.

MISCELLANEOUS

Ransom, H. K., and Kay E. B. Abdominal Neoplasms of Neurogenic Origin. *J. N. Surg.* 940, 700

The clinical and pathological features of 8 nerve-sheath tumors of the abdomen are presented and an attempt is made at their correlation. The authors classify abdominal neoplasms of neurogenic origin as follows:

I. Nerve-sheath tumors

A. Benign

1. Neurolemmoma (schwannoma — perineurial fibroblastoma)
2. Neurofibroma (of type associated with von Recklinghausen disease)
3. Cystic or plexiform neurofibroma
4. Ganglionated neurofibroma

B. Malignant

Neurogenic sarcoma

- II. Neuroblastic tumors of sympathetic system
 1. Sympathoblastoma
 2. Paraganglioma
 3. Ganglioneuroma

The authors have purposely excluded neuroblastic tumors from this report.

There is no uniformity of opinion as to the histogenesis of nerve-sheath tumors. Some believe they arise from the sheath of Schwann and, thus, are of neuro-ectodermal origin; others that they originate in the connective-tissue sheath of Henle and, therefore, of mesodermal origin. The authors believe that the exact site of origin cannot be stated with certainty since both types of tissue have a similar histological architecture. They believe that certain types of nerve-sheath tumors, which they designate "neurolemmomas," are composed primarily of Schwann cells, while others such as the neurofibromas are composed of both Schwann cells and fibrous tissue. The latter tumors are usually associated with generalized neurofibromatosis. However, the neurogenic tumors of the abdomen are usually solitary and not associated with other multiple abdominal or cutaneous tumors. In only one of the 8 cases were there stigmata of von Recklinghausen's disease.

The abdominal neurolemmomas are confined largely to the stomach and retroperitoneal regions. In the gastro-intestinal tract they arise from the sheaths of the sympathetic fibers of the submesocolic and mesenteric plexuses. In this series definite attachment to nerves could not be demonstrated. Grossly the neurolemmomas are usually well encapsulated, slowly expanding neoplasms. They are usually solid but may be cystic and they are less firm than carcinomas. The contour is oval or round and frequently nodular. The cut surface has whorled appearance and is gray to gray-yellow or gray-pink. Histologically there are areas of palisaded rows of cells and areas of whorling or interlacing bands (Antoni Type A and Type B tissue, respectively). The tumors are least likely to become malignant are those showing the most striking palisade arrangement. There were 6 cases of neurolemmomas in this series.

The term neurofibroma is here used to designate that type of nerve-sheath tumor usually found associated with von Recklinghausen's disease. These tumors differ from the neurolemmomas in that they contain more fibrous and fibroblastic tissue and bands of elongated spindle cells. They may become malignant. There were no examples of the plexiform or cistoid neurofibromas in this series. There were 3 neurofibromas all involving the intestine.

There was ganglionated neurofibroma located in the retroperitoneal space. These tumors arise from the sheaths about the ganglia and are usually retroperitoneal. The ganglion cells are of adult type and take no part in the tumor growth but are incidental to the location of the tumor. This dis-

ferentiates these tumors from ganglioneuromas which are known to be neuroblastic in origin and contain the ganglion cell as the actively growing tumor cell

Half the tumors in this series were neurogenic sarcomas. These tumors may arise upon neurolemmomas or may arise as sarcomas. Most evidence favors the former view. They are locally malignant but in the majority of cases fail to give rise to distant metastases. These tumors are of two types (1) the large infiltrating non-encapsulated sarcoma occurring in the retroperitoneal regions and mesenteries, and (2) the sarcoma found in the gastro-intestinal tract, encapsulated except for occasional breaks in the capsule where infiltration is seen. Histologically they resemble other spindle cell sarcomas, but certain areas of whorling, interlacing bands, or palisades of cells identify their origin.

The distribution of the 18 neurogenic tumors was as follows: stomach 7 cases, intestine 3, mesenteries 2, and retroperitoneal space 6 cases. In view of their distribution no pathognomonic symptoms of neurogenic tumors are to be expected. Those located in the stomach and intestine give rise to hematemesis or melena because of a tendency toward ulceration. Intussusception may occur with an intraluminal tumor of the intestine. The patient is usually in a

good state of nutrition in spite of a long history of illness and repeated hemorrhages. Palpation may not reveal a mass. Roentgenograms may show evidence of an intraluminal or extraluminal abdominal mass.

Generally speaking, the nerve-sheath tumors are not frequently encountered in the abdominal cavity. Certain organs such as the esophagus, colon, and rectum seem to be singularly immune, whereas the stomach is involved relatively often. Unlike many of the more commonplace abdominal neoplasms the neurogenic tumors are often discovered in unusual or bizarre places such as the mesenteries, omenta, or retroperitoneal spaces. They are expansively growing lesions and thus gradually tend to involve multiple adjacent organs secondarily. Eradication of advanced growths necessitates formidable surgical procedures.

In only 3 of the 8 neurogenic sarcomas in this series were distant metastases observed. Good end-results can be obtained by thorough removal of neurogenic sarcomas because of their tendency to remain localized for a long period of time. None of the neurogenic tumors can be considered entirely benign since they may become malignant or so large that surgical removal is formidable.

JOHN L. LINDQUIST, M D

GYNECOLOGY

UTERUS

Dea, P. Inversion of the Uterus. *J Obst & Gynaec Brit Emp* 1910, 47, 5, 5.

The major portion of the existing literature on inversion of the uterus has been collected and reviewed for this paper; it also includes a statistical study of 39 additional cases.

Probably inversion was recognized several thousand years B.C. as there are passages in the Ayurvedic literature which suggest that it was known to the Hindus. However the Arabian physician, Avicenna, who lived in the early part of the eleventh century A.D. for the first time gave a clear description of the differential diagnosis between inversion of the uterus and prolapse.

This complication may develop either in the puerperal or non-puerperal organ. It is almost five times more common in the former. Most writers believe that it occurs in about 1 of every 30,000 labors. However the incidence is higher in India, in every 8,500 labors. Inversion may be either acute or chronic. The distinction between acute or chronic in the puerperal variety is determined by the interval between the time of the accident and the time when treatment is sought. For the acute this is limited to thirty days. In the author's series 83.6 per cent of the inversions occurred in a puerperal uterus and 73.4 per cent of these were acute, whereas, of the non-puerperal cases, 9.4 per cent were chronic.

Inversion of the uterus may be either complete or incomplete. If any part of the fundus passes through the cervical ring it is called complete inversion. Practically all puerperal inversions are complete and associated inversion of the vagina is comparatively common.

The conditions necessary for the production of inversion of the uterus are thought to be (1) and den emptying of the uterus after distention of its cavity (2) thinning of its walls by the gradual development in it of some tumor and (3) a dilated cervix. Both pregnancy and fibroid polyp predispose the uterus to inversion by (1) rubbing the aforementioned conditions consequently almost all inversions occur in one or the other of these circumstances. Puerperal inversion may be either spontaneous or traumatic. Spontaneous inversion may result from vomiting, sneezing, straining, distended intestines, gas in the abdominal cavity, short umbilical cord, or the weight of the placenta. However the majority of instances some act of violence such as an improper method of expressing the placenta or deliberate traction on the umbilical cord, is responsible for the accident and such cases are considered traumatic.

Paresis of some portion of the uterine wall, particularly at the site of placental attachment, is the etiological factor considered most important for

spontaneous inversion. There are those who contend that this paresis is due to dreumatic anemia. Others have considered both muscular relaxation and contraction of the uterus as essential. Fetal attachment of the placenta is so general in cases of inversion, that it has been regarded as being almost essential to the production of this complication. A partially detached placenta with an accumulation of a large amount of blood behind it may by the weight of this blood, be of importance as a predisposing factor. An adherent placenta and organized placental polyp may also be responsible.

There are many cases in which inversion occurred as the result of the injudicious use of pituitary extract, ergot, and castor oil. Inversion has occurred after abortion and miscarriage, but it is usually associated with some direct trauma, such as pulling on the umbilical cord or forcible extraction of the fetus.

In the puerperal inversion occurs with almost equal frequency before and after delivery of the placenta. In the majority of cases, however, it begins at the end of the second stage of labor and is usually completed by the end of the third stage. On the other hand, inversion has been known to occur days, or even weeks, after the completion of the third stage.

Practically all instances of non-puerperal inversions are caused by fibroid tumors. Such tumors as rule are subserous; they are either sessile or have short thick pedicles. Inversion is especially likely to occur during extrusion of the tumor. Inversion has also been observed in patients with either sarcoma or carcinoma of the uterus.

In the author's series, 40 per cent of the puerperal cases were of the spontaneous type. Traction on the umbilical cord seemed to be responsible in 31 per cent and improper method of expressing the placenta in 9 per cent. The placenta was found either completely, or partially adherent in the fundus in 75 per cent of the cases. Five cases occurred during the second stage of labor, i.e., the inversion took place before the child was completely born. 7.5 per cent occurred during the third stage, 4.1 per cent within the first twenty-four hours following delivery, and 9.8 per cent between the second and thirtieth day of the puerperium.

Symptoms. The symptoms of acute inversion are greatly varied. There may be but few. Usually, however, acute inversion is characterized by shock, exhaustion, pallor, coldness, feeble pulse, hemorrhage and pain. The amount of uterine bleeding varies greatly; it is not excessive. The profoundness of the shock is in sharp contrast with the moderate loss of blood.

The duration of life in acute inversion of the uterus varies considerably; it depends upon the original condition of the patient and her ability to rally during the intervals of monthly bleeding. The

symptoms of chronic inversion are menorrhagia, metrorrhagia, leucorrhea, and pain. Retention of urine is not uncommon.

Diagnosis. Acute inversion can be suspected only from the patients' subjective symptoms. The diagnosis is easily made by vaginal examination when an intensely congested rather soft, pear-shaped bleeding tumor is found. The cervical ring, more or less contracted, is usually found encircling the tumor. If the placenta is still attached, the diagnosis is obvious.

The physical signs of chronic inversion are so similar to those of a polypoid tumor that great care is necessary to differentiate them. If one is cautious and palpates accurately for the exact position of the uterus and passes a sound into the uterine cavity, he can distinguish these lesions with certainty.

Prognosis. Acute puerperal inversion is a condition that demands prompt and intelligent management. The earlier it is recognized and treated, the better the prognosis. Without treatment the majority of acutely affected patients die of shock or hemorrhage. The average mortality in acute cases in recent years has been about 35 per cent.

Chronic inversion is not so alarming but death may result from repeated or continuous hemorrhage.

Prophylaxis. The most important prophylactic measure is avoidance of interference during the third stage of labor. Under no condition should the umbilical cord be dragged upon to facilitate separation of the placenta, and an improper method of expressing the placenta should never be employed. Before leaving the patient the obstetrician must ascertain that the uterus is firmly contracted and in its normal position.

Treatment. The treatment of acute inversion depends upon the amount of shock, the effect of hemorrhage, and the time of detection of the inversion. In cases unaccompanied by symptoms which are recognized immediately after the inversion occurs, manual replacement yields the best results. The most important cause of failure of manual reposition is a constriction of the cervical collar, intramuscular injections of adrenaline have been recommended to produce relaxation of the cervix. After replacement, firm contraction of the uterus should be promoted by hot intra uterine douches, injections of ergot and pituitrin, and uterine massage, if needed.

When inversion is accompanied by shock or collapse, immediate replacement is dangerous and often results in death. The shock should be treated first and attempts at replacement postponed until the patient has rallied. Obstetricians are not agreed whether the placenta should be removed before or after replacement of the uterus. When manual reposition fails or when the replacement has not been effected within the first forty-eight hours, it is advisable to wait until local swelling and infection have subsided. Then one may use an Aveling's repository or resort to the Huntington abdominal operation.

The treatment of chronic inversion depends upon its type, i.e., puerperal or non puerperal. In the non-puerperal cases due to tumor, vaginal hysterectomy with removal of the tumor is considered the treatment of choice. In the chronic puerperal cases, treatment may be either operative or non-operative. Non-operative treatment aims at replacement of the inverted uterus either gradually, by means of repositors, or rapidly, by taxis. For the most part, however, rapid reduction has been abandoned in favor of more gradual replacement. Operative treatment may be either conservative, in which the uterus is left in such condition that it is capable of function, or radical, in which the uterus is removed. Two types of operation have been employed, the Haultain abdominal operation and the more popular Spinelli vaginal procedure. Removal of the uterus by vaginal hysterectomy has a place in the treatment of chronic puerperal inversion also. Operative treatment of this chronic group has the following advantages: (1) manipulations are reduced to a minimum, (2) adhesions can be dealt with directly, (3) the constricting ring can be dilated, and (4) the rigid wall of the uterus can be managed in a manner which makes reposition easier and more certain. Operations of the Spinelli type offer the best prognosis.

END-RESULTS IN THE TREATMENT OF PUERPERAL INVERSION

	Acute		Chronic		Total
	Cures	Deaths	Cures	Deaths	
Manual reposition	145	24	22	2	193
Repositor	7	1	23	0	31
Laparotomy and reduction	11	0	5	0	16
Colpeurynter	3	1	2	0	6
Colpohysterotomy	0	0	15	0	15
Abdominal hysterectomy	4	0	1	0	5
Vaginal hysterectomy	2	1	3	0	6
Amputation	7	3	12	2	24
Spontaneous reduction	3	0	7	0	10
Douche	2	0	1	0	3
Total	184	30	91	4	309

It is apparent, from the foregoing table, that reposition was used in the greatest number of puerperal cases. However, laparotomy followed by a reduction in acute cases, and the use of the repository or colpohysterotomy in chronic cases, offer the best prognosis.

GEORGE H. GARDNER, M.D.

Cattaneo, L. A Case of Intraligamentary Bladder Complicating a Retrocervical Fibromyoma (Su un caso di vescica intraligamentaria complicante un fibromioma retrocervicale). *Arch. ital. di urol.*, 1940, 17: 277.

Distinction is made between the bladder which is infraligamentary and that which is intraligamentary. In the first case, the vesico-uterine reflection of the peritonium is elevated by the bladder, in the second the organ has found its way further cephalad and occupies a space limited by the two leaves of the

GYNECOLOGY

UTERUS

Des, P. Inversion of the Uterus. *J. Obst. & Gynaec. Brit. Emp.* 1910, 47, 55

The major portion of the existing literature on inversion of the uterus has been collected and reviewed for this paper; it also includes a statistical study of 30 additional cases.

Probably inversion was recognized several thousand years B.C. as there are passages in the Ayur veda literature which suggest that it was known to the Hindus. However the Arabian physician, Avicenna, who lived in the early part of the seventh century A.D. for the first time gave a clear description of the differential diagnosis between inversion of the uterus and prolapse.

This complication may develop either in the puerperal or non-puerperal organ. It is almost five times more common in the former. Most writers believe that it occurs in about 1 of every 30,000 labors. However the incidence is higher in India. In every 8,500 labors, 1 version may be either acute or chronic. The distinction between acute or chronic in the puerperal variety is determined by the interval between the time of the accident and the time when treatment is sought for the acute this is limited to thirty days. In the author's series 83.6 per cent of the inversions occurred in a puerperal uterus, and 73.4 per cent of these were acute whereas, of the non-puerperal cases, 9.4 per cent were chronic.

Inversion of the uterus may be either complete or incomplete. If any part of the fundus passes through the cervical ring, it is called complete inversion. Practically all puerperal inversions are complete and associated inversion of the vagina is comparatively common.

The conditions necessary for the production of inversion of the uterus are thought to be (1) sudden emptying of the uterus after distention of its cavity (2) thinning of its walls by the gradual development in it of some tumor and (3) dilated cervix. Both pregnancy and fibroid polyp predispose the uterus to inversion by furnishing the above mentioned conditions consequently almost all inversions occur in one or the other of these circumstances. Puerperal inversion may be either spontaneous or traumatic. Spontaneous inversion may result from vomiting, sneezing, straining, distended intestines gas in the abdominal cavity, short umbilical cord, or the weight of the placenta. However in the majority of instances some act of violence, such as an improper method of expressing the placenta or deliberate traction on the umbilical cord, is responsible for the accident, and such cases are considered traumatic.

Parents of some portion of the uterine wall, particularly at the site of placental attachment, is the etiological factor considered most important for

spontaneous inversion. There are those who contend that this paralysis is due to a adrenalinemia. Others have considered both unnatural relaxation and contraction of the uterus as essential. Fundal attachment of the placenta is so general in cases of inversion, that it has been regarded as being almost essential to the production of this complication. A partially detached placenta with an accumulation of a large amount of blood behind it may by the weight of this blood, be of importance as predisposing factor. An adherent placenta and engorged placental polyp may also be responsible.

There are many cases in which inversion occurs as the result of the judicious use of pituitary extract, ergot, and castor oil. Inversion has occurred after abortion and miscarriage, but it is usually associated with some direct trauma, such as pulling on the umbilical cord or forcible extraction of the fetus.

In the puerperium inversion occurs with about equal frequency before and after delivery of the placenta. In the majority of cases, however, it begins at the end of the second stage of labor and is usually completed by the end of the third stage. On the other hand inversion had been known to occur days, or even weeks after the completion of the third stage.

Practically all instances of non-puerperal inversion are caused by fibroid tumors. Such tumors as rule are submucous they are either sessile or have short thick pedicle. Inversion is especially likely to occur during extrusion of the tumor. Inversion has also been observed in patients with either sarcoma or carcinoma of the uterus.

In the thor series, 40 per cent of the puerperal cases are of the spontaneous type. Traction on the umbilical cord seemed to be responsible in 21 per cent and an improper method of expressing the placenta in 9 per cent. The placenta was found either completely or partially adherent to the fundus in 75 per cent of the cases. Five cases occurred during the second stage of labor, i.e., the inversion took place before the child was completely born. 72.3 per cent occurred during the third stage. 4 per cent within the first twenty four hours following delivery and 9.8 per cent between the second and thirtieth day of the puerperium.

Symptoms. The symptoms of acute inversion vary greatly. There may be but few. Usually, however, acute inversion is characterized by shock, cyanosis, pallor, coldness, feeble pulse, hemorrhage, and pain. The amount of uterine bleeding varies usually it is not excessive. The profoundness of the shock in sharp contrast with the moderate loss of blood.

The duration of life in chronic inversion of the uterus varies considerably. It depends upon the original condition of the patient and her ability to rally during the intervals of monthly bleeding. The

symptoms of chronic inversion are menorrhagia, metrorrhagia, leucorrhoea, and pain. Retention of urine is not uncommon.

Diagnosis. Acute inversion can be suspected only from the patients' subjective symptoms. The diagnosis is easily made by vaginal examination when an intensely congested rather soft, pear shaped bleeding tumor is found. The cervical ring, more or less contracted, is usually found encircling the tumor. If the placenta is still attached, the diagnosis is obvious.

The physical signs of *chronic* inversion are so similar to those of a polypoid tumor that great care is necessary to differentiate them. If one is cautious and palpates accurately for the exact position of the uterus, and passes a sound into the uterine cavity, he can distinguish these lesions with certainty.

Prognosis. Acute puerperal inversion is a condition that demands prompt and intelligent management. The earlier it is recognized and treated, the better the prognosis. Without treatment the majority of acutely affected patients die of shock or hemorrhage. The average mortality in acute cases in recent years has been about 35 per cent.

Chronic inversion is not so alarming but death may result from repeated or continuous hemorrhage.

Prophylaxis. The most important prophylactic measure is avoidance of interference during the third stage of labor. Under no condition should the umbilical cord be dragged upon to facilitate separation of the placenta, and an improper method of expressing the placenta should never be employed. Before leaving the patient the obstetrician must ascertain that the uterus is firmly contracted and in its normal position.

Treatment. The treatment of acute inversion depends upon the amount of shock, the effect of hemorrhage, and the time of detection of the inversion. In cases unaccompanied by symptoms which are recognized immediately after the inversion occurs, manual replacement yields the best results. The most important cause of failure of manual replacement is a constriction of the cervical collar, intramuscular injections of adrenaline have been recommended to produce relaxation of the cervix. After replacement, firm contraction of the uterus should be promoted by hot intra-uterine douches, injections of ergot and pituitrin, and uterine massage, if needed.

When inversion is accompanied by shock or collapse, immediate replacement is dangerous and often results in death. The shock should be treated first and attempts at replacement postponed until the patient has rallied. Obstetricians are not agreed whether the placenta should be removed before or after replacement of the uterus. When manual replacement fails or when the replacement has not been effected within the first forty-eight hours, it is advisable to wait until local swelling and infection have subsided. Then one may use an Aveling's repositior or resort to the Huntington abdominal operation.

The treatment of chronic inversion depends upon its type, i.e., puerperal or non-puerperal. In the non-puerperal cases due to tumor, vaginal hysterectomy with removal of the tumor is considered the treatment of choice. In the chronic puerperal cases, treatment may be either operative or non-operative. Non-operative treatment aims at replacement of the inverted uterus either gradually, by means of repositors, or rapidly, by taxis. For the most part, however, rapid reduction has been abandoned in favor of more gradual replacement. Operative treatment may be either conservative in which the uterus is left in such condition that it is capable of function, or radical, in which the uterus is removed. Two types of operation have been employed, the Haultain abdominal operation and the more popular Spinelli vaginal procedure. Removal of the uterus by vaginal hysterectomy has a place in the treatment of chronic puerperal inversion also. Operative treatment of this chronic group has the following advantages: (1) manipulations are reduced to a minimum, (2) adhesions can be dealt with directly, (3) the constricting ring can be dilated, and (4) the rigid wall of the uterus can be managed in a manner which makes reposition easier and more certain. Operations of the Spinelli type offer the best prognosis.

END-RESULTS IN THE TREATMENT OF PUERPERAL INVERSION

	Acute		Chronic		Total
	Cures	Deaths	Cures	Deaths	
Manual reposition	145	24	22	2	193
Repositor	7	1	23	0	31
Laparotomy and reduction	11	0	5	0	16
Colpeurynter	3	1	2	0	6
Colpohysterotomy	0	0	15	0	15
Abdominal hysterectomy	4	0	1	0	5
Vaginal hysterectomy	2	1	3	0	6
Amputation	7	3	12	2	24
Spontaneous reduction	3	0	7	0	10
Douche	2	0	1	0	3
Total	184	30	91	4	309

It is apparent, from the foregoing table, that reposition was used in the greatest number of puerperal cases. However, laparotomy followed by a reduction in acute cases, and the use of the repositior or colpohysterotomy in chronic cases, offer the best prognosis.

GEORGE H. GARDNER, M.D.

Cattaneo, L. A Case of Intraligamentary Bladder Complicating a Retrocervical Fibromyoma (Su un caso di vescica intraligamentaria complicante un fibromioma retrocervicale). *Arch ital di urol*, 1940, 17: 277.

Distinction is made between the bladder which is intraligamentary and that which is intraligamentary. In the first case, the vesico-uterine reflection of the peritoneum is elevated by the bladder, in the second the organ has found its way further cephalad and occupies a space limited by the two leaves of the

broad ligament. Only 14 of such anomalies have been reported and the majority of them were infra-ligamentary.

Cattaneo reports the case of forty-eight year-old house-maid who complained of dysuria, difficulty in initiating micturition, and occasional retention. Physical examination showed moderate hypertension, with evidence of mitral stenosis and insufficiency with slight decompensation. The urine contained abundant globules of pus. The posterior wall of the vagina was found on pelvic examination to be elevated by a mass the size and form of an orange which filled the pouch of Douglas. The body of the uterus was difficult to make out and appeared to form part of the solid mass which was incarcerated in the true pelvis. On the basis of these findings, a diagnosis of retrocervical intra-ligamentary fibromyoma was made.

At operation, tumorfaction was found which was definitely cystic and distended the right broad ligament. The walls of the tumor however appeared to be formed of muscle tissue. Catheterization of the bladder was then performed and resulted in the reduction of the intra-ligamentary mass after the removal of 300 c.c.m. of urine. The other side was then examined and the uterus was found to contain multiple fibromyomas, one large portion of which occluded the pelvis. Total hysterectomy was then performed and was followed by an uneventful recovery.

Rare as such cases are, their pathogenesis is of practical as well as theoretical interest. Of particular note is the fact that the anterior parietal peritoneum, after being reflected over the symphysis, descended almost to the inferior margin, and thus caused the bladder to rise higher with relation to the anterior aspect of the uterus. The author considers this abnormality to be congenital. The development of the fibroids which push the bladder still higher and exert pressure on the urethra accounts for the symptoms and new relationships. Thus the bladder which is both intra-ligamentary and intra-ligamentary should probably be considered as being secondarily affected, in contradistinction to the congenital intra-ligamentary bladder. EDITH FARNER ORTE, M.D.

Gertlach, W. Early Histological Diagnosis of Pavement-Epithelium Carcinoma of the Portio (Ueber die histologische Frühdiagnose des Plat-tenepithelcarcinoms der Portio) *Ztschr. f. Geburtsh. Gynäk.* 94, 2.

Formerly the criteria for the diagnosis of pavement-epithelium carcinoma of the portio included destructive growth in the musculature, typical cells, and mitoses. These signs are still extremely important today but they are usually present in far-advanced cases in which diagnosis presents no particular difficulty. It is of the greatest importance to be able to diagnose definitely the thickest beginning carcinoma, or to be able to recognize it as such from superficial scrapings by biopsy or curettage. Great difficulty encountered in the differentiation from

the benign pavement-epithelium proliferations is invasion glands and mucosal polyps, the so-called endometrialization. Robert Meyer in particular has made a study of this problem and presented the basis for definite differentiation between benign and malignant proliferation. In benign endometrialization there is likewise a apparent depth penetration of the invasion of the glandular tissue by the pavement-epithelium which fills them without any significant change in their shape. The carcinomatous glands penetrate but the lumen of the glands changes their shape to larger blunt club-like forms. Another striking feature is the marked receptivity of the stroma of the carcinoma cells. Carcinomatous epithelium is only rarely involved in inflammatory liquefaction which is almost always a sign of malignant proliferation. The glycogen deficiency described in Lahti and others as characteristic of pavement-epithelium carcinoma is not so constant as to be of value in confirming the diagnosis.

On the basis of 56 selected cases all diagnostic significance possibilities are discussed. For the future it is recommended that curettage be performed in addition to every exploratory excision and biopsy. (MALLER) EDITH SCHWARTZ, M.D.

ADRENAL AND PERIUTERINE CONDITIONS

Pollon, K. Theca-Cell Tumors (Clinical and Pathological Contributions (Beiträge zur Klinik und Pathologie der Theca-Drüsenneubildung))

The personal cases of theca-cell tumors from the Woman's Clinic II in Budapest are added to the 3 cases in the literature, which were first described by Morrell and Arregui (1907) and then by Loeffler and Priessl (1913).

The first case is that of fifty-one year-old woman who had undergone curettage twice previously for irregular bleeding and both times as found to have glandular hyperplasia. Since the bleeding did not stop after the curettages, the patient returned to the clinic after one year of almost constant bleeding. The uterus was freely movable, in "ante-vertikal-flektierter" position, and as large as fist the adnexa were normal. Another curettage as done and again glandular hyperplasia as found. Six days later x-ray castration as performed and resulted in amenorrhea which lasted for six months. Because of the recurrence of bleeding, the uterus and adnexa were completely removed vaginally. The uterus was markedly enlarged, the thickened endometrium and fimbrial polyps. On its posterior wall there was pedunculated myoma the size of nut. The left ovary was trophic and the right had been changed into knobby tumor of the size of nut, surrounded by smooth connective-tissue capsule through which small and large butter-yellow areas were visible. Histologically there was glandular hyperplasia of the endometrium with endometrial polyps and slight degree of adenomyoma of the middle of the uterus. The ovaria showed as fibromatous in character. In some areas the fibroblast cell were

transformed into closely packed polyhedral cells of epithelial type. These cells, so similar to the cells of the theca interna, had a delicate intracellular network and contained, as did the fibromatous part, lipid substance which stained readily with Sudan and Scharlach red.

The second specimen was designated in the laboratory protocol as a mixed cell sarcoma and as such was preserved in the museum of the clinic. The fifty-one year old patient, after one year of menopause, had bled irregularly for one year, the duration of bleeding sometimes being two weeks. A period of amenorrhea ensued and lasted until admission of the patient who complained of enlargement of the abdomen and pain of three years' duration. To the left of the somewhat enlarged uterus, an ovarian tumor about the size of a fist and a half was found, it was moveable and knobby. The tumor which was removed was pedunculated and had undergone torsion. Healing per primam followed. The condition of the uterus and the fate of the patient were not recorded. Macroscopically and microscopically the tumor was identical with the one which was just described.

A review of the morphological and clinical findings in theca cell tumors, which are sharply differentiated from other ovarian tumors, was presented. The tumors were always unilateral (21 right, 11 left). The smallest was of the size of a bean, the largest of the size of a head. Usually they were of the size of a nut, an egg, or a fist, surrounded by a connective tissue capsule, smooth or slightly knobby, remarkably hard with a gray white surface layer, and were marked with typical small or large yellow spots. Histologically, in addition to the spindle shaped tissue cells, large polygonal and epithelioid cells were found close together. These cells had light cytoplasm and large nuclei and resembled the luteinized cells of the theca interna. The gradual transition of the two cell types (fibrous and theca cells) was easily demonstrated since even in the parts containing theca cell the desmoid character was retained. Both cell types contained lipoids which consist principally of cholesterol and its ester. The lipid content is not a sign of regressive changes, but of vitality or function of the cells. Most of the women with these tumors were at least fifty years old (18), 7 times the tumor was found in women between twenty and fifty years of age, and 3 times in women under twenty years of age. The youngest patient was sixteen, the oldest ninety two.

Clinical symptoms were irregular bleeding and pressure symptoms caused by the size of the tumor. In 11 cases there was no complaint of irregular bleeding. In 20 of the remaining 22 cases bleeding was found. Sometimes metrorrhagia alternated with amenorrhea. The hyperplastic uterine mucosa was plainly found to be the cause of the bleeding (hyperplasia in 16 cases, atrophy in 2 cases, and in 15 cases no information was given).

The tumor is almost always benign, only 3 authors describe malignant cases with metastases. Frank

ascites, and clinical and histological indications of malignancy. The uterine bleeding, the hyperplastic myometrium and endometrium, and the myomas and the adenomyomas associated with the tumor indicate hormonal activity on the part of the tumor. It has a close affinity to the granulosa-cell tumor, which is not surprising since the theca cell tumor as well as the granulosa-cell tumor develops from the mesenchyme.

Therapeutically the only course is to remove the tumor, after which the irregular bleeding always stops. The theca-cell tumor appears to be more resistant to the x-rays than the granulosa cell tumor.
(HANS HEIDLER) RONALD R. GRIFFIN, M.D.

EXTERNAL GENITALIA

Pachner, F. Artificial Vagina (Kuenstliche Scheide) *Gynaekologie*, 1939, 4, 142

The author reports on 7 cases of construction of an artificial vagina. In 1 case a vagina was constructed before the patient's twenty-third year from a resected loop of ileum, by the method of Baldwin, Haeblerlin and Mori. The patient is now married for the third time and her husband is unaware of the operation. In 2 cases a portion of the rectum was resected, according to Schubert's method, and used for the vaginal construction. The functional result was good in both cases, however, in 1 case the rectum could be sutured only under strong tension and 2 rectovaginal and 1 sacral fistula developed. After several plastic operations there remained only a very small rectovaginal fistula which caused only slight discomfort to the patient. Two cases were operated upon by the skin-flap plastic method of Kirschner and Wagner. The functional results were good except that the vagina was somewhat short.

Gambarov's method, in which only one wound cavity is formed and is kept open by a prothesis and dilatation until epithelization occurs, was used in 2 cases. In the last case the wound cavity was filled with a "skin-pulp" on the eighteenth postoperative day. This skin-pulp was prepared by mixing equal parts of vaseline, cod-liver oil, and finely divided particles of skin obtained with sterile precaution from the back of a recently deceased fetus. After four days the minute skin islets had grown attached. The anatomical and functional results of Gambarov's operation were so satisfactory that the author looks upon it as the best method.

(R. K. FELKEL) JOHN L. LINDQUIST, M.D.

Ferreira, Marques, J., and Vieira, M. Lipschuetz Disease—Ulcus Vulvæ Acutum (Maladie de Lipschütz) *Arq. de patol.*, 1940, 12, 123

Ferreira Marques and Vieira report a case of Lipschuetz disease in a girl twelve years of age—the first case of this disease to be reported in Portugal. While earlier writers called attention to the appearance of ulcer on the vulva, usually accompanied by slight fever and sometimes by cutaneous and buccal lesions, Lipschuetz in 1912 was the first

broad ligament. Only 4 of such nodules have been reported and the majority of them were intra-ligamentary.

Cattaneo reports the case of forty-eight year-old house maid who complained of dysuria, difficulty in initiating micturition, and occasional retention. Physical examination showed moderate hypertension, with evidence of mitral stenosis and insufficiency with slight decompensation. The urine contained abundant globules of pus. The posterior wall of the vagina was found on pelvic examination to be elevated by a mass the size and form of an orange which filled the pouch of Douglas. The body of the uterus was difficult to make out and appeared to form part of the solid mass which was incarcerated in the true pelvis. On the basis of these findings, diagnosis of retrocervical intraligamentary fibromyoma was made.

At operation tumefaction was found which was definitely cystic and distended the right broad ligament. The walls of the tumor however appeared to be formed of muscle tissue. Catheterization of the bladder was then performed and resulted in the reduction of the intraligamentary mass after the removal of 300 ccm. of urine. The other side was then examined and the uterus was found to contain multiple fibromyomas, one large portion of which occluded the pelvis. Total hysterectomy was then performed and was followed by an uneventful recovery.

Rare as such cases are, their pathogenesis is of practical as well as theoretical interest. Of particular note is the fact that the anterior parietal peritoneum, after being reflected over the symphysis, descended almost to the inferior margin, and thus caused the bladder to rise higher with relation to the anterior aspect of the uterus. The author considers this abnormality to be congenital. The development of the fibroids which push the bladder still higher and exert pressure on the urethra accounts for the symptoms and new relationships. Thus the bladder which is both intraligamentary and intraluminal should probably be considered as being secondarily affected, in contradistinction to the congenital intraligamentary bladder. *Enoch Laxenroth, M.D.*

Gerlach, W. Early Histological Diagnosis of Pavement Epithelium Carcinoma of the Portio (Ueber die histologische Frühdiagnose des Plattenepithelcarcinoms der Portio) *Zeitschr. f. Geburtsh. Gynäk.* 94, 9.

Formerly the criteria for the diagnosis of pavement-epithelium carcinoma of the portio included destructive growth in the musculature, atypical cells, and mitoses. These signs are still extremely important today but they are usually present in far-advanced cases in which diagnosis presents a particular difficulty. It is of the greatest importance to be able to diagnose definitely the tiniest beginning carcinoma, or to be able to recognize it as such from superficial scrapings by biopsy or curettage. Great difficulty is encountered in the differentiation from

the benign pavement-epithelium problems in erosion glands and mucosal polyps, the so-called epidermatization. Robert Meyer in particular has endeavored to solve this problem and prevented the inevitable definite differentiation between benign and malignant proliferation. In benign epidermatization there is likewise an apparent depth penetration, invasion of the glandular tubules by the pavement epithelium which fills them without any apparent change in their shape. The carcinoma cells do not penetrate into the lumen of the glands, changing their shape to larger blunt club-like forms. Another striking feature is the marked necrotic character of the carcinoma cells. Carcinomatous epithelium is only rarely involved in inflammatory liquefaction which is almost always a sign of benign proliferation. The glycogen deficiency described by Laemm and others as characteristic of pavement epithelium carcinoma is not so constant as to be of value in confirming the diagnosis.

On the basis of 76 selected cases all diagnostically significant possibilities are discussed. For the definite diagnosis it is recommended that curettage be performed in addition to every exploratory extension and curettage.

(M. M.) *Enoch Laxenroth, M.D.*

ADRENAL AND PERIUTERINE CONDITIONS

Fallos, K. Theca-Cell Tumors (Clinical and Pathological Contributions) (Beiträge zur Klinik und Pathologie der Theca-Cell-Tumoren)

Two personal cases of theca-cell tumors from the Woman's Clinic II in Budapest are added to the 5 cases in the literature, which were first described by Moravitz and Arregui (1937) and then by Loeffler and Priemel (1938).

The first case is that of a fifty-four-year-old woman who had undergone curettage twice previously for irregular bleeding and both times as found to have glandular hyperplasia. Since the bleeding did not stop after the curettages, the patient returned to the clinic after one year of almost constant bleeding. The uterus was freely movable in a sub-vertico-flekter position and as large as a fist. The adnexa were normal. Another curettage as well as again glandular hyperplasia as found. Six days later x-ray castration as performed and resulted in amenorrhoea which lasted for six months. Because of the recurrence of bleeding the uterus and adnexa were completely removed vaginally. The uterus was markedly enlarged, the thickened endometrium and frenal polyps. On its posterior wall there was pedunculated myoma the size of a nut. The left ovary as atrophic and the right had been changed into a knobby tumor of the size of a nut, surrounded by smooth connective tissue capsule through which small and large blotter yellow veins were visible. Histologically there was a glandular hyperplasia of the endometrium with endometrial polyps and slight degree of adenomyosis of the inside of the uterus. The ovarian tumor was fibromatous in character. In some areas the theca cells were

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Pomerance, W., and Daichman, I. The Effect of a Salt-Poor Diet During Pregnancy upon the Duration of Labor *Am J Obst & Gynec*, 1940, 40 463

There were 46 patients in the original group of patients on a salt-poor diet, 29 primiparas and 17 multiparas. The average lengths of labor in the two groups were 9.6 hours and 6.5 hours, respectively. In the control series there were 49 patients, 33 primiparas and 16 multiparas, the average lengths of labor were 22.9 hours and 9.0 hours, respectively. In the second group on a salt-poor diet there were 32 patients, 22 primiparas with an average labor of 10.4 hours, and 10 multiparas with an average length of labor of 4.7 hours.

It would seem quite evident, from a study of the 78 patients on a salt-poor diet with adequate control, that there is a definite reduction in the duration of labor following the use of such a diet during pregnancy.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Tapfer, S. Studies on the Significance of the Follicular Hormone in Labor (Untersuchungen ueber die Bedeutung des Follikelhormons fuer die Geburt) *Arch f Gynaek*, 1940, 170 68

Castrated guinea pigs were given a preliminary treatment of varying duration with varying doses of follicular hormone. The response of the uterine cornua to 0.001 Voegtlin units of orasthin was then compared to that occurring in untreated castrated guinea pigs (Magnus Kehrers specimens). When follicular hormone is absent the uterus does not have the capacity for rhythmic activity and responds to posterior pituitary hormone by a gradual increasing tonus terminating in a tetanic condition. Follicular hormone endows the uterus with the capacity for responding to posterior pituitary hormone with rhythmic contractions, thus counteracting, as it were, the production of the tetanic state. Under the influence of the follicular hormone, the uterus responds to various stimuli with regular labor pains. This effect is produced not only by mechanical and thermal stimuli, but also by ergot preparations. Thus, for instance, an almost full ampoule of gynergen added to 9 c.c. of perfusion fluid will produce only rhythmic contractions in the uterus of an animal having received the preliminary treatment.

In 3 women in the third, fourth, and fifth months of normal pregnancy, the latter could not be interrupted by the administration of from 47 to 95 mgm of progynon B oleosum over a period of from seven to ten days. On the contrary, in 3 patients with retained miscarriages, the administration of from 45 to 60 mgm of progynon resulted in expulsion of the

dead fetus within from twelve to fifteen days. Post partum palpation was necessary in only 1 of these 3 cases. Also in the second half of pregnancy expulsion of the dead fetus could be accomplished only by use of follicular hormone (from 30 to 150 mgm in from four to sixteen days) in 4 cases.

The effect of the follicular hormone upon the course of labor was studied in 20 primiparas of more than thirty-five years of age, 20 primiparas not receiving the follicular hormone being used as controls. Obstetrical interventions were required more frequently in the latter, and this same group had to remain nearly twice as long in the hospital as that which received 5 mgm of follicular hormone from one to four times during labor.

Progynon will reduce the number of forceps operations in cases of primary insufficiency of labor pains.

In 1 case of rachitic narrow pelvis, after the administration of 10 doses of 5 mgm of progynon B, the symphysis was twice as wide post partum as it was five months later. In 4 cases of apparent protracted pregnancy, delivery followed the administration of from 65 to 130 mgm in from eight to fifteen days. The author now makes it his practice in cases of protracted pregnancy to give two doses of 5 mgm each of progynon B daily from the eighth to the tenth day after the calculated term. If no labor pains have developed after 100 mgm have been administered the treatment is discontinued. In these cases there has usually been a miscalculation as to the date of term on the part of the patient.

(BUETTNER) EDITH SCHANCHE MOORE

PUERPERIUM AND ITS COMPLICATIONS

Sheehan, H. L. Post-partum Necrosis of the Anterior Lobe of the Pituitary Gland *Lancet*, 1940, 239 321

Ten cases of post-partum necrosis of the anterior lobe of the pituitary gland are reported by Sheehan and added to his 15 cases previously reported as evidence to support the contention that necrosis of the anterior lobe of the pituitary gland is due to collapse of the patient at delivery, usually as a result of severe obstetrical hemorrhage.

Massive necrosis occurred in 2 of the 10 cases. In both cases there was massive puerperal hemorrhage with severe and prolonged collapse, followed by sepsis. In the first case the anterior lobe of the pituitary gland was almost completely necrosed, there being only small amounts of living tissue remaining at the base of the stalk and directly under the capsule. In the second case there was almost complete necrosis and, in addition, marked infection around the periphery.

Four cases showed recent small necroses. Two of the patients had mitral heart disease, and two had had surgical procedures. Hemorrhage was not so

to describe the condition as clinical entity (ulcus vulvae acutum) having definite bacteriological cause.

Lipchuets disease occurs most frequently in girls and young women who are virgins, from fourteen to twenty years of age. The first symptom is pain sometimes associated with redness and swelling, in the vulva there is usually slight fever, and occasionally a considerable rise in temperature and chills. The ulcers then develop usually they involve both the labia minora and majora, and sometimes they extend to the anus. Four types of ulceration are distinguished: (1) the acute or gangrenous type with some necrosis; (2) the subacute or "venereal" type, in which the lesions resemble chancroid; (3) the villary type in which the ulcers are very small but numerous, found in association with the "venereal" type of ulcer; and (4) single ulcer simulating early syphilitic chancre. A bacillus named by Lipchuets the "bacillus crassus" is always found in the ulcers, sometimes associated with staphylococci or the pseudodiphtheria bacilli. The bacillus crassus is from 1 to 3.5 μ in length it is Gram-positive and sometimes occurs in short chains it is immobile and a facultative anaerobe. It grows in a glucose-ascites medium or in the Löffler-Jensen medium, and also in a glucose-liver medium described by Okamoto; the cultures have hairy appearance. The lesion of ulcus vulvae acutum is very vascular, the walls of the blood vessels being thickened and surrounded by lymphocytes, the capillaries and precapillaries are chiefly involved, sometimes the venules, but

rarely the small arteries. These pathological changes in the blood vessels distinguish the ulcers from any other lesion found on the vulva. In cases of the gangrenous type of ulcer, there is frequently an associated erythematous lesion of the skin, polymorphous or papulopustulosis, and there are also small ulcers in the mouth. The bacillus crassus found in both the skin and the mouth lesions.

In the authors case the patient was sixteen years of age, who had begun to menstruate when always been in good health. She developed pain and feeling of heat and pain in the vulva, the temperature rose to 40 degrees and was associated with malaise, chills, and headache. The ulcers on the vulva developed on the third day and later a polymorphous erythema appeared on the extremities. The vulvar lesions were of the gangrenous type and the bacillus crassus was isolated from them in large numbers. The patient recovered in seven weeks, but the labia minora had been entirely destroyed and the labia majora partially destroyed by necrosis; the scar was soft, showing no trace of sclerosis.

There were several points of interest in this case which the authors noted: the age of the patient, who was younger than the patients in the typical cases and had just begun to menstruate; the extensive destruction of the vulvar tissues (the authors find no similar case reported); the duration of the symptoms, which usually does not exceed five or three weeks; and the severity of the general symptoms, which suggested septicemia.

ALICE M. MERRIS

The author describes a case of chorio-epithelioma in the vagina. The patient, a married woman of twenty-four, had been delivered of a normal child at term on April 10, 1939. She was admitted to the hospital on October 24 of the same year for hemorrhage from the uterus. On October 30 the uterus was curetted and the curetted tissue showed normal villi. She was discharged free of hemorrhage and with the cervix closed. She was brought back on December 1 with profuse hemorrhage and acute anemia from loss of blood. Examination quite unexpectedly showed that the hemorrhage was not coming from the uterus but from a small bluish tumor on the anterior wall of the vagina at the boundary between the lower and middle thirds. It was the size of a small cherry, sharply circumscribed, and it projected into the lumen of the vagina. At the most convex point there was an opening from which blood was flowing freely.

The patient was given intravenous injections of glucose solution and stimulants and a few days later when her general condition had improved sufficiently the tumor was excised into sound tissue. Microscopic examination showed typical chorio-epithelioma. Histological pictures are given in the original article. The patient was treated with 30 mgm of radium applied to the vagina for four successive days and was given 14 injections of human chorionic villi reduced to the stage of ultrapeptones. She was discharged in good condition. Further observation and repeated biological examinations will demonstrate whether the cure is permanent or temporary.

The author discusses the question of whether this chorio-epithelioma developed from the normal pregnancy or from a later abortion and concludes that it probably resulted from the latter.

AUDREY G. MORGAN, M.D.

pronounced factor in the production of collapse in these cases. Death occurred in each case several days after the collapse and the autopsy small areas of recent necrosis were found in the anterior lobe of the pituitary gland.

Three cases coming to post-mortem examination gave a history of having had severe hemorrhages in previous deliveries. In each of them healed scars were found in the anterior lobe of the pituitary gland, they being evidence of previous necrosis.

The necroses of the anterior lobe of the pituitary gland are due to collapse of patients at delivery usually because of severe hemorrhage. Other factors, such as heart-disease, toxemia, dystocia, may also result in collapse with the production of necrosis. The incidence and size of the necrosis depend on the gravity of the patient's condition at the delivery. The lesion is not directly fatal, but may produce hypoglycemia hence glucose infusions are indicated. A small necrosis is harmless, but if patient with large necrosis survives, she develops the syndrome of severe hypopituitarism (Simmonds disease) subsequently. *Lester H. Roney, M.D.*

Pérez, M. L., and Bólgan, L. Puerperal Recrudescence of an Endocarditis. Gangrene of the Extremities (Reagudación puerperal de una endocarditis. Gangrena de las extremidades). J. de Inst. de maternidad y obst. social, 1929, 24.

The authors describe the case of a woman, aged thirty-five years, who except for very marked edema of the lower extremities had a normal pregnancy and labor but had slight rise of temperature during the first six days of the puerperium when she left the hospital in spite of advice to the contrary. Four days after her return home, she developed pain in the calf of the left leg and swelling of the entire limb, and eight days later blue patches were found on the dorsum of the foot which gradually turned black. On readmission one month after delivery, the patient was found to have marked presystolic mitral murmur with duplication of the second sound, and increase in the size of the heart. The left leg presented a blackish color from the toes up to its lower third, and purple patches and blisters with turbid content higher up to the upper limit of the knee where the skin still had its normal aspect. Palpation of the foot gave the impression that it was mummified. The right leg presented some brown patches and the dorsum of the foot was nearly completely covered by purple patches. The entire left extremity and the right one to above the knee were cold. Injections of acetylcholine during the first three days did not give any results, and no sign of an arterial pulse could be discovered instrumentally in either extremity. Pervascular sympathectomy and exploration of the arteriovenous vessels were decided upon. At operation large amount of organized blood clots was removed from the left internal saphenous vein, and organized and recent blood clots were found in the left femoral artery their extraction followed by weak flow of blood. The

same intervention was attempted on the right leg, but it was impossible to reestablish the circulation in the femoral artery. Three days later the left extremity seemed to be improving, but the condition of the right extremity was greatly aggravated. Ever after another four days, the gangrene involved both extremities to the same degree and reached beyond the middle of the thighs. Autopsy revealed that the entire aorta was filled with blood clots and that the mitral valve presented old scars and some vegetations which are easy to detach organized clots were found in the ventricle and on these on vegetations.

The authors discuss the most common cause of puerperal gangrene of the extremities, which is of arterial or venous origin, but always due to an acute infection. However they exclude this cause in the present case because of the absence of the violent symptoms which characterize this class of septic puerperal processes. They rejected erysipelas, pyaemia, disease, and septic thrombo-arteritis as possible causes and finally considered the cause to be embolism due to an old lesion in the left ventricle or the aorta. These embolisms are rare in actual stenosis and some aneurysms, but not so rare here, as in the reported case, the primary lesion is covered with fresh vegetations, which reveal the presence of a recent recrudescence of the disorder. The autopsy observations of Alders and others show that recent changes in the endocardium are superimposed on old lesions in a large percentage of patients with cardiac diseases. There is no doubt that the backup of pregnancy and the traumata of labor contribute to the recrudescence of old valvular lesions and it is not surprising that the reactivated lesions are capable of giving rise to embolisms which may obstruct vessels and lead to gangrene. Nor is it strange that the phase of recrudescence passes unnoticed in the present case, because its general symptoms of tachycardia, subfebrile temperature, and anemia are usually slight and not always associated, while respiratory signs are absent or masked or thought to be due to the old lesion. *RICHARD KERR, M.D.*

MISCELLANEOUS

Doca, A. Study of a Case of Ectopic Chorionic Epithelioma (Contributo alla conoscenza del neoplasma ectopico). Folia dermatol. graec. 24, 37, 1929.

An ectopic chorio-epithelioma is one that develops in some organ other than the uterus. Almost any primary tumor is the term of L. Ben. Schödl says that primary ectopic chorio-epitheliomas are really metastases from chorio-epitheliomas that have developed in the placenta and has been expelled in toto without having become implanted and developed in the uterus. These ectopic tumors are most frequently found in the vagina or lung, though they have been seen in the ovary kidney liver uterine choroid, brain, bladder broad ligament and rectovaginal septum.

Braasch, W F, and Jacobson, C E Chronic Bilateral Pylonephritis and Hypertension *J Urol*, 1940, 44 571

An analysis of 180 cases of chronic bilateral pyelonephritis revealed an incidence of hypertension in 26.1 per cent, or an increase of 6 per cent over that found in the authors' control group of cases. This increase was particularly prominent among patients with pyelonephritis who were less than fifty years of age, among these patients the incidence of hypertension was found to be almost twice that noted in the control group. The incidence of hypertension among the patients fifty years or more of age was found to be approximately the same in both groups. The comparison of the incidence of hypertension found in identical age groups also revealed a higher incidence of hypertension among those patients who had pyelonephritis than among those making up the control group.

An apparent relationship was found to exist between the incidence of hypertension and the duration of symptoms of pyelonephritis. Although in most cases the incidence of hypertension increased with the duration of symptoms, there were some cases in which the blood pressure remained normal after the pyelonephritis had existed for from fifteen to twenty years.

Apparently there is also a relationship between the degree of pathological change in the kidneys and ureters, as evidenced by the degree of deformity as shown in the urogram and the incidence of hypertension. The highest incidence occurs in those cases in which the pathological changes are found to be most marked.

Impaired renal function does not necessarily imply the presence of hypertension. In fact, the blood pressure was normal in more than half of the cases in which impaired renal function was noted. However, hypertension was found twice as often in patients with impaired renal function as in individuals with normal renal function.

In approximately 75 per cent of our cases of hypertension the systolic blood pressure was less than 180 mm of mercury, and in only 4 cases was it more than 200 mm of mercury. Thus, though it appears that pyelonephritis contributes to the incidence of hypertension, the hypertension occurring in these cases is usually of a comparatively benign nature.

The usual types of microorganisms found in infections of the urinary tract were found in the authors' series of cases of pyelonephritis. The incidence of hypertension among the patients affected with *aerobacter aerogenes* infection may be significant.

Hypertension is occasionally observed in cases of mild or recurrent chronic pyelonephritis in which the renal function is normal and there is no evidence of urographic deformity. From various clinical data, the hypertension appears to be of independent origin and may be termed "essential hypertension."

Ercole, R, and Fort, A Anthrax of the Kidney, 2 New Personal Observations (*Antrax del riñón a propósito de dos nuevas observaciones personales*) *Rev. argent. de urol*, 1940, 9 301

The authors think that anthrax of the kidney is not as rare as seems to be indicated by the small number of cases reported in the world literature. Since 1934, they have observed 4 cases of this disorder, and during the same period, they have attended to 30 cases of perirenal phlegmon, 5 of which were secondary to this preexisting renal process and 25 of which belonged to the group of so called primary perirenal phlegmons, consequently, 16 per cent of the latter were cases of pyonephritis of the anthrax type. The authors describe their 4 cases.

According to Graves and Parkins, the preoperative diagnosis has been made in only 11 of 67 cases, however, this statement is in direct opposition to the personal experience of the authors, who succeeded in establishing the diagnosis in their 4 cases by means of pyelography. Undoubtedly, pyelography is the best method to determine the presence of the process, as shown by Huguier's series of 39 cases, in 25, or 64 per cent, the method provided positive diagnostic data, in 11, or 28 per cent, the pyelogram was normal, and in 3 it did not allow definite conclusions. In general, the pyelogram of anthrax is so similar to that of renal tumor that confusion may arise, especially in cases of febrile cancer of the kidney. The anomalies observed in Huguier's series included compression of the small calyces, displacement of a large calyx or of a ureter, enlargement or constriction of the calyx, enlargement with constriction of the calyx, or partially lacunar calyx. In addition, the filling of necrosed or softened zones may simulate caverns. There were filling defects in 2 of the authors' cases and displacement of the upper and lower large calyces in another case.

Renal anthrax develops only exceptionally toward the cavities of the kidney, it has a tendency to infect the perirenal tissue, and give rise to a perirenal phlegmon which is the complication by which the anthrax manifests itself clinically in a large number of cases. Patients without this complication present more or less evident signs of general infection associated with symptomatic pain in the lumbar region. As a rule, the patient gives a history of infection one or two months previously, such as a furuncle, an anthrax, or a whitlow. Urine examination is usually negative with regard to the presence of pus, this is natural, when one considers the typical evolution of the process. Excretion pyelography is indicated in every case of perirenal phlegmon, even a negative picture is of diagnostic value. In case of doubt, ascending pyelography should be done.

The treatment of renal anthrax is surgical and the type of operation will depend on the localization of the process and the amount of intact renal parenchyma, nephrectomy is indicated when the anthrax involves a large part of the parenchyma or is located deeply in the body of the kidney, otherwise, the

GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Ferrebee J. W. Ragan, C., Atchley D. W., and Loeb, R. F. Desoxycorticosterone Acetate, Corticosterone, and Cortical Extract in Addison Disease. *Endocrinology* 410, 27, 300.

The writers report observations made upon a well established case of Addison disease. The study consisted of the comparative effects of desoxycorticosterone acetate, corticosterone, and of cortical extract upon the electrolyte and water metabolism, the carbohydrate metabolism, the protein metabolism, and upon the circulation time. During the study the patient was given 6 mgm. of desoxycorticosterone acetate daily which had been found to maintain a normal electrolyte pattern in the patient's blood. During separate periods of study the patient was given an additional 20 mgm. of corticosterone for two days, 7.5 mgm. for two days, and 15.5 mgm. for one day. During the last period 7 cc. of cortical extract were given three times daily. The studies were done on a metabolism service. The diet was standardized throughout the study.

At the conclusion of each period of observation the blood was examined for the following: sodium, potassium, calcium, magnesium, chloride, bicarbonate, phosphorus, cholesterol, serum protein, and non-protein nitrogen. The glucose tolerance was also determined at the conclusion of each period of study as were the venous pressure, circulation time, and vital capacity. Blood-pressure determinations were made twice daily. Daily 24 specimens of urine were analyzed for ammonia and chloride. Aliquots of the daily urine specimens were analyzed after each period for sodium, potassium, and nitrogen.

All three preparations had some effect upon the excretion of sodium and potassium salts. The increased dose of desoxycorticosterone acetate caused a much greater increase in the potassium excretion with comparable drop in the sodium excretion. None of the preparations had any demonstrable effect upon the nitrogen excretion. In all three studies differences in the carbohydrate metabolism were minimal. There was a very slight rise in the blood sugar in the fasting half hour and one hour specimens when the glucose tolerance tests were made after treatment with corticosterone and with cortical extract. The large doses of desoxycorticosterone caused a significant rise in the systolic blood pressure and the venous pressure.

RUTH W. RAWSON, M.D.

Rindone A. Clinical and Experimental Studies: Treatment of Acquired Hydronephrosis (Criteri clinali sperimentali nel trattamento della idronefrosi acquisita). *Arch. ital. di urol.*, 1940, 7, 324.

The author presents a case of hydronephrosis secondary to an impacted ureteral calculus in which

simple incision and drainage of the ureter with removal of the calculus resulted in the reestablishment of renal function in a kidney which had been blocked for more than three months. After nine years, ligation on the involved side as demonstrated to be equal to that on the uninvolved side. Experimental studies are also reported in which ureters were ligated unilaterally in rabbits and dogs by the transperitoneal route, after exteriorization of the bladder had been performed in order to render accessible the lower portions of the ureters. A length of time was allowed to elapse, which varied in the rabbits from five to sixty-two days, in the dogs from five to forty-five days. Twelve dogs were operated upon and the following observations were made.

Ligation of the ureter tends to produce a hydronephrosis of moderate degree. If the stasis is allowed to continue up to the twenty-fourth and forty-fifth days of the experiment, respectively atrophy of the kidney parenchyma occurs.

1. The principal findings in such kidneys consisted of degenerative changes in the tubules and the glomeruli, and proliferation of the interstitial tissue.

2. The reestablishment of function is possible after fifteen days when the hydronephrosis is not complicated by infection. If such intervenes, however the parenchymal tissue undergoes in a few days such profound anatomical changes as to render the organ unable to perform its excretory function.

3. The incidence of infection is fairly high, 33 per cent in the present series.

A second group of animals, consisting of rabbits, was similarly treated. The data obtained in the two groups showed rather marked differences, both anatomical and functional. Whereas in the dog the blocking of the ureter resulted in an atrophic kidney considerably reduced in volume and mass, in the rabbits there was voluminous hydronephrosis with external dilatation of the ureters, pelvis, and calyces, but little if any atrophy. These differences are attributed by the author to the divergent functions of the kidney in herbivora and carnivora, of which the experimental animals were types.

In the application of these studies to clinical practice objection is raised that the block resulting from ligation of the ureter is abrupt and complete and therefore not strictly comparable to that secondary to an impacted calculus, which is in most cases gradual and incomplete. The effects upon the renal parenchyma are therefore different, as well as the respective capacity for recovery of function. Notwithstanding this objection, evidence is obtained that total or partial return of function may be expected in kidneys obstructed for protracted periods of time, and that the chief indication for removal of the kidney should be a degree of destruction ordinarily caused only by superimposed infection.

FEDERICO LANDIS OSTER, M.D.

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The treatment of renal anthrax is surgical and the type of operation will depend on the localization of the process and the amount of intact renal parenchyma, nephrectomy is indicated when the anthrax involves a large part of the parenchyma or is located deeply in the body of the kidney, otherwise, the

Intervention will be conservative. Operative difficulties will depend on the degree of sclerosis of the perirenal tissue, the sclerosis increasing proportionately to the time during which the anthrax has been present or to the time elapsed between the beginning of the drainage of the perirenal abscess and the intervention on the kidney in case of secondary nephrectomy. The operative mortality was 1 per cent in 50 cases of primary nephrectomy of one series, but rose to 50 per cent in 8 cases of secondary nephrectomy of another series. There was no operative mortality in the 3 cases of the authors in which nephrectomy was performed 2 of these were secondary nephrectomies.

Among the conservative interventions may be cited decapsulation and drainage, drainage and thermocoagulation or curettage of the lesion, nephrotomy partial nephrectomy, and enucleation of the anthrax. Drainage following decapsulation or thermocoagulation is indicated only in cases in which the anthrax tends to form an abscess, provided it does not justify more radical treatment. Enucleation of the process and partial nephrectomy are ideal interventions. Conservative treatment, all the more so as it is possible to find cleavage plane between the anthrax and the healthy renal tissue, which allows excision of the lesion with the finger.

RICHARD KESSL, M.D.

Capacci F. Errors of Interpretation in Retrograde Pyelography for the Diagnosis of Renal Tumors (Error di interpretazione della pielografia retrograda nella diagnosi dei tumori renali). Arch Ital di Urol 940, 7: 354.

The retrograde pyelogram is generally conceded to be the most valuable procedure for the diagnosis of renal tumors, especially when the classical syndrome of pain, hematuria, and palpable tumor is not yet present. Even by this method, however, errors occur which may be due to the following two possibilities: (1) the pyelogram may appear normal although the kidney may contain neoplasm and (2) the pyelogram may show a deformity characteristic of malignancy in kidney which contains no trace of neoplastic change. The conditions which are capable of altering the endorenal contours are: (1) change of the function and morphology by direct or reflex effect upon the nervous or muscular elements, (2) mechanical factors inside or outside of the urinary tract, or (3) congenital deformities, which may result in abnormal roentgenograms. In the first category belong those dysplasias resulting from imperfect synergism between the extrinsic and the intrinsic innervations of the urinary tract which are chiefly characterized by spasm, atonia, or dilatation.

Six cases are reported in which the condition began suddenly, the abundant and persistent hematuria unaccompanied by bladder symptoms. By means of the cystoscopic examination, the lesion was found to be unilateral and localized in the upper urinary tract. The retrograde pyelogram showed definite change in the renal pelvis. On the basis of these

data the diagnosis of tumor was manifestly the first to be ruled out and surgical exploration was done. In each of the 6 cases neoplasm was excluded. How then, were the morphological changes found in the pyelogram to be accounted for? The connection existing between the so-called pyelo-arterial dysplasia and hemorrhagic nephritis is persistent, attention having been directed along those channels since the work of Fuchs in 1905. This author demonstrated the case with which even minimal inflammatory process, in attacking the form of one of the calyces, could cause the development and rupture of large venous trunks and precipitate hematuria. That the x-ray profile could be thus altered by small clots soon became evident. It remained for Hinman to show that such foci in the fornices could appear as a result of stasis or other functional disturbances.

In a second group of cases, the author presents examples of mechanical factors which alter the contours of the urinary tract. Such factors may be extrinsic or intrinsic. They include intra-abdominal tumors as well as paraneural or retroperitoneal tumors. A case is here reported in which macroscopic hematuria was never present and the patient complained only of lumbar pain. Its radiation to the gluteal region of the same side and intense nocturnal exacerbations. A fixed mass was palpated in the region of the left kidney which was symptomatic of pericapsular tumor. The mass contained many broomsticks, with hyaline and granular cast. The intravenous pyelogram showed a deformed left pelvis, the lower part of which was entirely obliterated. Retrograde urography pointed to the diagnosis of a renal tumor and only a most searching revision of the evidence led finally to the diagnosis of an extrarenal, retroperitoneal neoplasm. Another case is reported which illustrates errors arising from the presence of blood clot in the pelvis of the kidney which prevents the normal filling and produces the appearance of a deformity on the x-ray film.

In the third group are placed those alterations in the endorenal cavity which are associated with congenital malformations. Here again the differential diagnosis is difficult, and even the most discerning roentgenologist may not be able to rule out renal tumor. In such cases exploratory surgery is the opinion of the author is indicated.

EDITH FARMWORTH, M.D.

Kessell, D. D. and Kirshbaum, J. D. The Relationship of Benign and Malignant Hypernephroidism to Errors of the Kidney (Clinical and Pathological Study of 77 Cases to 12,335 Necropsies). J. Urol 940, 44: 435.

Thirty-three cases of hypernephroid adenoma (or so-called benign hypernephroma) are reported, all of which were incidental post-mortem findings. These tumors showed marked predilection to occur in white males of an average age of sixty and nine-tenths years. Six of these benign growths occurred simultaneously with an unrelated type of malignant tumor. The tumor, as usually smaller

cavity left behind was drained extravasically and the defect closed with one or more layers of continuous sutures. A large de Pezzer catheter was introduced into the bladder for drainage.

In 6 cases the technique employed was eversion of the sac by section through glass tube.

In 2 cases the diverticulum was removed extravasically. In 8 patients the bladder was opened anteriorly and its wall divided down to the orifice of the diverticulum. The orifice was then circumcised and the diverticulum removed extravasically.

In 4 cases the bladder was opened anteriorly without further dissection and the diverticulum removed extravasically.

Wound infections and prolonged urinary drainage occurred frequently. Epididymitis, phlebitis, pyelonephritis, and bacteremia were the other most common complications. Eight patients died before leaving the hospital, death in 5 being due to pyelonephritis and remia.

In 50 per cent of the cases, urinary drainage continued for more than forty days. Persistent prostatic obstruction was a relatively frequent cause.

Symptomatic and functional results were excellent in 55 cases, good in 25 cases, fair in 10 cases, and poor in 5 cases.

JOHN A. LORT, M.D.

GENITAL ORGANS

Roschelen, A. The Present Stand of the Treatment of Prostatic Hypertrophy (Der heutige Stand der Behandlung der Prostatahypertrophie). *Fortschr. d. Therap.* 1934, 5, 95.

In 1931 Botenandt was able to produce the male active substance in chemically pure form from the urine of young males. He called this extract androsterone. In 1935, Laqueur was able to isolate chemically pure hormone from the steer testicle in crystal form—testosterone.

In regard to the origin of prostatic hypertrophy the opinion that it is a neoplasm, a fibromyosarcoma, has prevailed. The para-urethral glands are affected by the proliferation. Loesekka and Adrien divide the prostate into outer and inner glands. The latter is a group of glands, which is embedded in the musculature of the internal vesical sphincter. These are joined by the para-urethral glands up to the urethra. The outer gland atrophies from the pressure of the proliferating masses, and from it the so-called surgical capsule develops. According to Adrien, the vascular supply of both of the glandular portions is important. While the internal prostatic artery which supplies the inner gland, has abundant anastomoses with the vesico-urethral artery as result of which an ampler blood supply of the inner gland is provided in arteriosclerosis of the prostatic artery this is not the case with the external prostatic artery. The causes of prostatic hypertrophy are the arteriosclerosis, in addition to endocrine processes, especially the production of gonadotropic hormones of the anterior lobe of the pituitary gland (prolan and gonado-

stimulin B). The development of the prostatic hypertrophy is then caused by a disturbed quantitative relationship between female and male hormones in the sense that in advanced age the female hormone overbalances the male hormone.

According to the author this explains the nature of action of the hormonal treatment of prostatic hypertrophy. The reports of the different authors on this subject especially are contradictory. Results are achieved even with the female hormone. It is certain, however, that the hormones are generally stimulating and increase the tones of the bladder musculature. Vell and Lippman found a distinctly increased pressure of the urinary stream following the administration of testosterone. This method of treatment was carried out at the Konjertum Clinic after resections of the prostate in cases in which freedom from residual urine could not be achieved in spite of complete removal of the obstructing passage, detrusor weakness being present.

Hormone therapy is also to be considered in the first stage of prostatic hypertrophy, as long as the patients are free from residual urine, for the relief of dysuria and nycturia. A specific effect of the hormone upon the enlarged human prostate gland has not been definitely proved according to the author. If the patient is seen in the second stage with from 100 to 200 ccm. of residual urine, prostatectomy that is, excision of the adenoma, should be done. Under all circumstances, sufficient renal function is demanded: the excretion of dyes by the kidney, the effluent matter in the blood (the residual nitrogen of the blood should not amount to more than 40 mgm.), the urinary excretion and concentration, and the blood pressure should be determined and an electrocardiogram to reveal the cardiac and circulatory conditions should be made.

According to the author the method of removal is of no decisive importance in the curative result. The suprapubic method is preferred at the Konjertum Clinic: their mortality amounted to 10 per cent in 50 cases. The perineal method has the disadvantage of fistula formation or incontinence, while the suprapubic enucleation has the danger of hemorrhage. In all cases with non-intact cardiac and renal system the transurethral resection of the prostate is indicated. It was carried out in 100 cases, and only in 1 of 80 benign prostatic enlargements as there is isolated enlargement of the middle lobe. A prerequisite for the electroresection is the possibility of introducing the resectoscope into the urethra. Here also careful investigation of the renal function is necessary just as in enucleation. The two-stage operation was often done, as considerably less hemorrhage is encountered at the second operation than at the first. In addition to the bleeding of the operation late hemorrhages from the casting off of coagulated eschar also may occur. The mortality was 5 per cent. Of the patients who were treated by resection 70 per cent showed improvement in their condition, and 30 showed no change. At any rate, the majority of the patients can be saved from the for-

mation of a bladder fistula or the need of a catheter for the rest of their lives by electroresection

(GEBELE) LOUIS NEUWELT, M D

Vest, S A Perineal Prostatectomy *Surgery*, 1940, 8 778

The author describes a modification of the technique of closure of perineal prostatectomy as follows

Routine perineal prostatectomy, according to the technique described by Young, has been carried out and needs no reiteration here. It should be emphasized, however, that, in order to facilitate the proper use of the sutures, the surface of the prostatic capsule should have adequate exposure and the inverted V-incision should be slightly wider and larger than usual. This makes the placing of the sutures, to

be described, less difficult. Figure 1 shows the various steps the author has found advisable in cases in which there seems to be an unusual amount of vascularity at the vesical orifice in order that postoperative hemorrhage may be kept at a minimum or entirely controlled. 1 shows the prostatic cavity immediately following thorough removal of a large adenoma. The vesical orifice is pulled well into view by two long tenaculums which have grasped it anteriorly and posteriorly. The adenoma has been cleanly cut from the vesical orifice and posterior urethra by means of the scissors.

By means of a boomerang needle, the long double suture of No. 1 plain catgut has been pulled through the vesical orifice in the region of 2 o'clock. This suture is shown with Young's boomerang needle

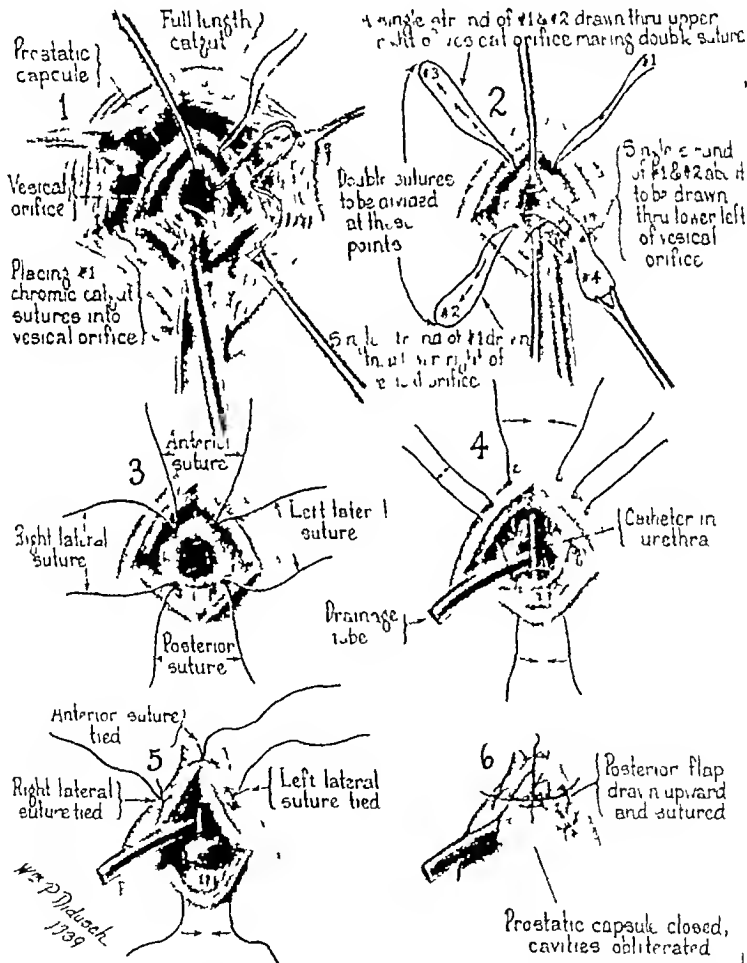


Fig 1 Technique of reconstructing the vesical orifice to eliminate hemorrhage following removal of benign prostatic hypertrophy

cavity left behind was drained extravasically and the defect closed with one or more layers of continuous sutures. A large de Pezzer catheter was introduced into the bladder for drainage.

In 6 cases the technique employed was eversion of the sac by section through a glass tube.

In 4 cases the diverticulum was removed extravasically. In 8 patients the bladder was opened anteriorly and its wall divided down to the orifice of the diverticulum. The orifice was then circumcised and the diverticulum removed extravasically.

In 4 cases the bladder was opened anteriorly without further dissection and the diverticulum removed extravasically.

Wound infections and prolonged urinary drainage occurred frequently. Epididymitis, phlebitis, pyelonephritis and bacteremia were the other most common complications. Eight patients died before leaving the hospital, death in 5 being due to pyelonephritis and uremia.

In 50 per cent of the cases, urinary drainage continued for more than forty days. Persistent prostatic obstruction was relatively frequent cause.

Symptomatic and functional results were excellent in 55 cases, good in 15 cases, fair in 10 cases, and poor in 5 cases.

JOHN A. LOTT, M.D.

GENITAL ORGANS

Rosbaken, A. The Present Stand of the Treatment of Prostatic Hypertrophy (Der heftige Stand der Behandlung der Prostatahypertrophie). *Fortschr. d. Therap.* 1935, 5, 95.

In 1913 Butenandt was able to produce the male active substance in a chemically pure form from the urine of young males. He called this extract androstosterone. In 1935, Laqueur was able to isolate a chemically pure hormone from the steer testicle in crystal form—testosterone.

In regard to the origin of prostatic hypertrophy the opinion that it is neoplasia, a fibromyoadenoma, has prevailed. The para-urethral glands are affected by the proliferation. Lomelski and Adison divide the prostate into outer and inner glands. The latter is a group of glands, which is embedded in the musculature of the internal vesical sphincter. These are joined by the para-urethral glands up to the urethra. The outer gland trophies from the pressure of the proliferating masses, and from it the so-called surgical capsule develops. According to Adison, the vascular supply of both of the glandular portions is important. While the internal prostatic artery which supplies the inner gland, has abundant anastomoses with the vesico-urethral artery as a result of which an ample blood supply of the inner gland is provided in arteriosclerosis of the prostatic artery this is not the case with the external prostatic artery. The causes of prostatic hypertrophy are the arteriosclerotic, in addition to endocrine processes, especially the production of gonadotropic hormones of the anterior lobe of the pituitary gland (prolan and gonado-

stimella B). The development of the prostatic hypertrophy is then caused by disturbed quantitative relationship between female and male hormones in the sense that in advanced age the female hormone overbalances the male hormone.

According to the author this explains the manner of action of the hormonal treatment of prostatic hypertrophy. The reports of the different sections on this subject especially are contradictory. Results are achieved even with the female hormone. It is certain, however, that the hormones are gonadostimulating and increase the tones of the bladder musculature. Veil and Lippman found detrusor increased pressure of the urinary stream following the administration of testosterone. This method of treatment was carried out in the Konjektz Clinic after resections of the prostate, in cases in which freedom from residual urine could not be achieved in spite of complete removal of the obstructive passage, detrusor weakness being present.

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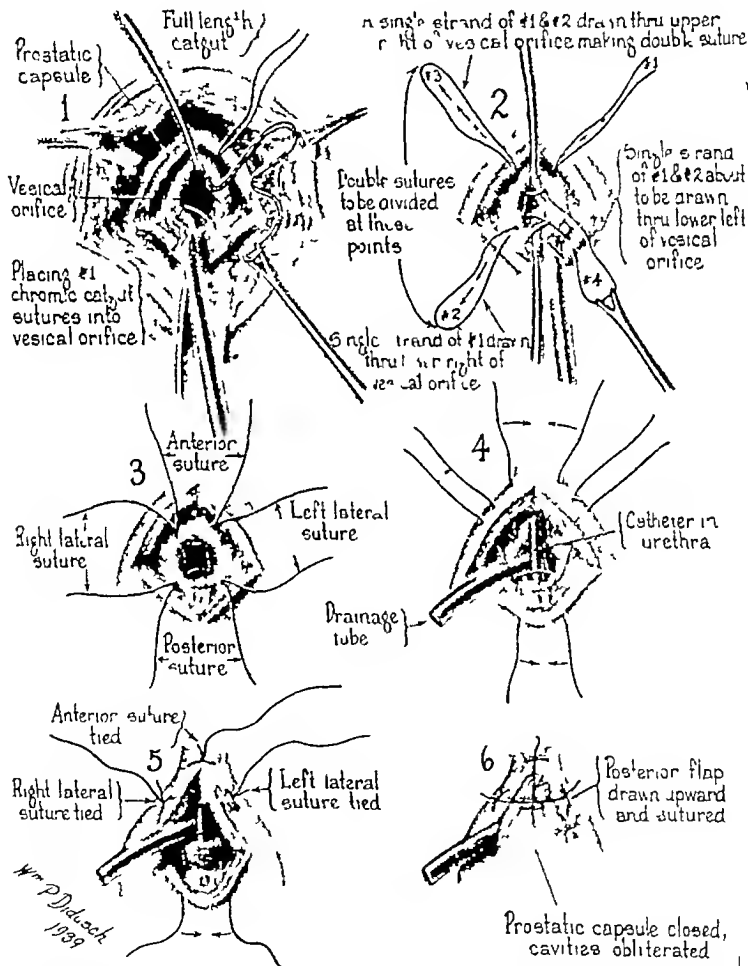


Fig 1 Technique of reconstructing the vesical orifice to eliminate hemorrhage following removal of benign prostatic hypertrophy

just before it is grasped and pulled through the vesical orifice in the region of 8:00 o'clock. These sutures are taken rather deeply into the vesical orifice so that they will include any retracted open vessels that might be on the bladder side. The placing of this suture may be awkward sometimes because a complete length of catgut, even though doubled, is not quite long enough. This can be remedied by tying two lengths together before beginning the procedure.

In 3 the double suture has now been pulled through the vesical orifice both in the region of 10:00 and of 8:00 o'clock, following which a single strand of the double suture which transveres the vesical orifice has been grasped and pulled through the vesical margin in the region of 10:00 o'clock and the boomerang needle is shown in the act of pulling the remaining strand across the vesical orifice through the margin in the region of 4:00 o'clock, following which the sutures are divided at the points labelled 3, 3, and 4.

The situation after these sutures have been cut is shown in Figure 3. There are shown four individual sutures to the vesical orifice which are indicated as anterior, posterior and right and left lateral. As

will be seen in 3, each strand of the left lateral suture, for example, goes through the same needle hole in the vesical orifice as the adjacent anterior and posterior suture so that no vesical orifice margin is left between in which a spurting artery might exist. The four sutures, therefore, include the entire 360 degrees of vesical orifice.

In 4 these four sutures have been pulled through the corresponding areas in the prostatic capsule, following which a urethral catheter and a small perineal drainage tube are shown in place. It will be noted that the anterior suture has been placed far anteriorly in the prostatic capsule so that when it is tied the anterior lip of the vesical orifice is pulled down on the anterior surface of the catheter and the anterior margin of the vesical orifice will then very closely approximate that of the divided urethra. The portion of the prostatic cavity where the anterior prostatic commissure and urethra once existed is thus obliterated.

The lateral sutures are next tied as shown in 5. The last procedure is to tie the posterior suture which ligates the ejaculatory ducts. After the sutures have been tied, a single strand of each is divided as shown in 6.

It can be seen that the single strand of posterior suture has been tied to the anterior and the two laterals have been tied across the midline. The tying of the posterior to the anterior has carried forward the tip of the inverted flap and reapproximated it into its original position with the tube coming out one of the limbs. Sometimes a small single suture is placed on the opposite side of the V as shown in 6 to close completely the prostatic capsule except at the point where the tube emerges.

With this type of closure the vesical orifice is thoroughly circumscribed in its 360 degrees and is pulled down into the cavity of the prostatic capsule

very near to the stump of the membranous urethra. This tends to produce early obliteration of the prostatic capsule and leaves only a very short bridge for the regenerating mucosa of the vesical orifice to traverse before it meets the mucosa of the membranous urethra. The perineal tube is withdrawn at the end of twenty-four or forty-eight hours according to whether or not perineal drainage is necessary because of infection.

The remainder of the perineal wound is closed according to the usual technique which consists of pulling the levator ani muscles together with plain catgut and suturing the perineal skin with interrupted wasted silk or catgut sutures.

JOSEF L. LOE, M.D.

Bendandi, G., and D'Agostino, M. Spermatocoele (Spermatocoele) *Clin. chir.* 2:26, 6, 24

The authors cite the 93 cases of spermatoceles gathered by Whitney in 1905 and add 8 cases reported since that date, of which 11 came under their personal observation.

The tumor may appear at any age after the establishment of spermatogenesis, but is far more frequently encountered in the second half of life. Etiological factors commonly incriminated are trauma, infection (either gonococcal or non-specific) and prolonged sexual abstinence associated with frequent stimulation. The theories of pathogenesis commonly advanced are

Neof ormation.

Derivation of the cyst from residues of the Wolffian body.

3. Formation from spaces due to failure of fusion of the tunica vaginalis testis.

4. Dilatation and retention either in the paradidymis or ducts.

Of these theoretical origins, that of the Wolffian body and that of dilatation and retention in the ejaculatory passages have obtained most support. The cysts may be intravaginal or extravaginal, the latter often becoming extremely large, while the former may be multifollicular but for the most part smaller. The walls are ordinarily thin but tough, and composed of a layer of connective tissue covered with an endothelial layer. Smooth muscle fibers are also found in the areolar tissue, which represent the attenuated elements of the displaced layer surrounding the efferent ducts. The contained liquid

generally opalescent and milky because of the presence of spermatozoa. If allowed to stand, it separates into two layers, the upper one clear the lower dense and creamy. If sperm are absent the liquid may be clear and yellowish. This fluid may be differentiated from that found in hydrocoele by the reaction which is neutral or slightly alkaline, a low specific gravity which varies from 1.00 to 1.009, the low albumin content rarely exceeding 60 gm. per cent, and mineral content varying between .73 and .83 gm. per cent.

The symptomatology of this condition may be that of an endocrotal mass or sensation of eight

and tension of the involved testicle, or symptoms may be entirely absent and the tumor may have escaped the attention of the patient. On examination the testicle is found to be independent of the cyst with the lower pole of which it is in contact. Transillumination is of scant usefulness because the tumor may prove to be translucent or opaque. Conditions to be differentiated from spermatocele are hydrocele, hematocele, chylocele, and tumors of the epididymis and testicle. Aspiration may be resorted to if necessary to establish the diagnosis. The uniform consistency, (soft or tense), fluctuation (which, however, is not invariably present), and the slow and progressive growth exclude neoplasms as well as tuberculosis of the epididymis. The prognosis is excellent, and malignant degeneration has never been reported.

Treatment consists of radical excision of the cyst, which is easily accomplished under local anesthesia. If the testicle is atrophic or the patient aged, the testicle should be removed as well.

EDITH FARNSWORTH, M D

Hunt, R W. Ectopic Testis, Report of a Case of Bilateral Ectopia Testis Pelvica and Its Surgical Correction. *J Urol*, 1940, 44 325

A case of bilateral ectopia testis pelvica is presented and a brief discussion of the etiology, diagnosis, and surgical correction is made by the author. The conclusion is drawn that the intra-abdominal ectopic testis can be diagnosed only by exploratory operation. This is best done in the fourteenth year, because if the testicle is going to descend spontaneously it will in the majority of cases have done so

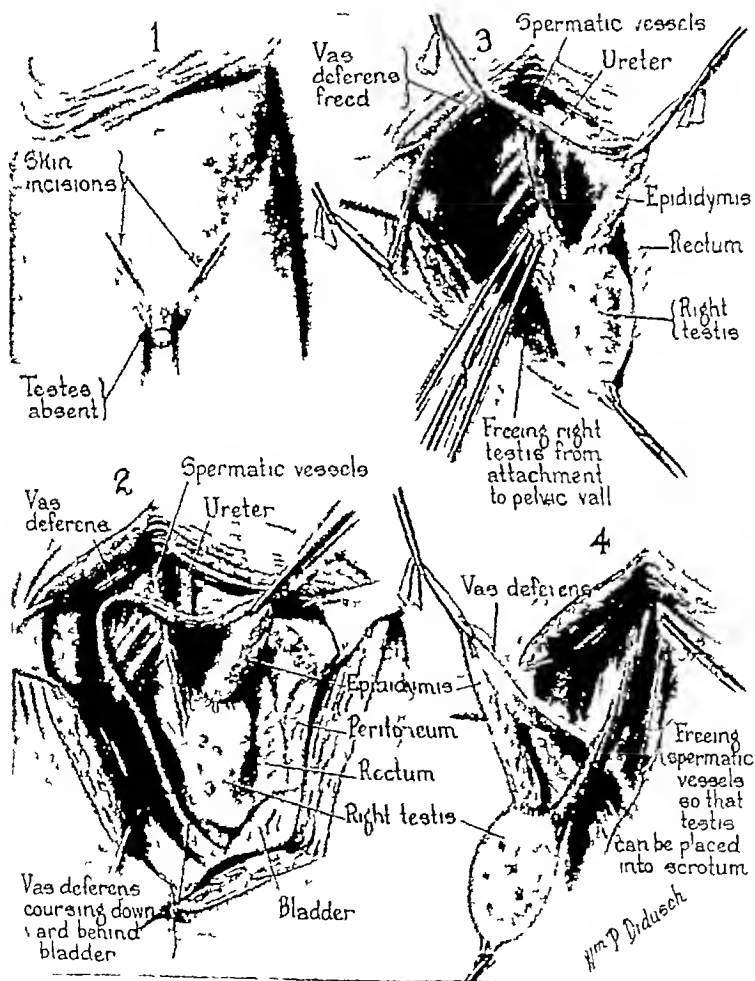


Fig 1 1, Skin incisions, 2, original location and attachments of right testis, 3, freeing attachment to testis, 4, freeing spermatic vessels



Fig. 1 Method of anchoring testis in scrotum. Testis maintained in scrotum by attaching suture to thigh.

t or before this age better not the patient has had hormonal treatment. D. E. McCRAY, M.D.

Melickow M. M.: Embryoma of the Testis. *J. Urol.* 94: 44, 1955.

The author presents an unusual testicular tumor throughout which were distributed waves of syncytial cells resembling those of the chorionic epithelium seen in pregnancy. This finding plus intense chorionic reaction and gross anatomy supported the conclusion that he was dealing with a tumor in a male containing numerous embryos in various stages of development. Those of the blastula stage were the earliest ever seen in a human being.

An attempt made by the author to explain the findings on the basis of pathological embryology suggested a comprehensive classification of testicular tumors in general and this is presented.

D. E. McCRAY, M.D.

Dreyfuss, M. L., and Lubash, S.: A Contribution on Malignant Mixed Tumor of the Spermatic Cord (Lipo-Osteofibrosarcoma). *J. Urol.* 1949, 61: 314.

An unusual tumor of the spermatic cord, a lipo-osteofibrosarcoma is presented by the authors. The original tumor had been present for fourteen years and was first noticed as a firm, pea sized nodule in the left scrotum. Within 6 months following an apparently complete removal, the patient was re-operated upon for a recurrent tumor mass. Pathological diagnosis revealed a malignant lipo-osteofibrosarcoma of the spermatic cord, and the authors point out that the mixed sarcomas of the spermatic cord do not follow clinical course which is different from that of ordinary sarcomas.

D. E. McCRAY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Ferguson, A B The Treatment of Osteogenic Sarcoma *J Bone & Joint Surg*, 1940, 22 916

This article is the author's second one on this subject and presents further indications that early amputation is not the best treatment of osteogenic sarcoma. It analyzes cases seen within two months of the onset of symptoms to show that lack of haste in amputating improves the results.

Early amputation is that done before the seventh calendar month after the onset of symptoms.

Survivors are defined as patients alive more than five years after the last treatment of the local lesion with no evidence of tumor at the last report.

The cases studied are the first 400 of undisputed osteogenic sarcoma which furnished the necessary data for tabulation, recorded in the Registry of Bone Sarcoma of the American College of Surgeons.

The favorable results obtained at various clinics or hospitals registering 10 or more cases included in this series appeared to be proportionate to the lack of haste in amputating.

Males and females had similar survival rates with each of the various types of treatment which indicated that the disease was equally malignant in the two sexes. Females were treated without amputation more often, and by early amputation less often than the males without a higher death rate ensuing.

Early amputation was used more frequently in cases registered in later years than in those registered in the earlier years. The increase in early amputations was not accompanied by an increase in survivors. The campaign for earlier amputations resulted in an increase in very early amputations among the early amputations in the later periods of the Registry. Early amputations increased approximately 50 per cent and very early amputations approximately 100 per cent, but the survivors of early amputations decreased from 11.6 per cent to 2.5 per cent.

Amputation without previous radiation yielded poor results in the cases seen early after the onset of symptoms.

In 82 cases seen within two months of the onset of symptoms and treated by amputation, neither age, site, variation in treatment, nor degree of malignancy estimated histologically explains the fact that the earlier amputations had the poorer results.

In no case did the patient survive amputation in the first month after the onset of symptoms.

In no case did the patient survive early amputation if between the ages of one and ten or if more than twenty.

No patient survived early amputation if the lesion was not at the distal portion of the femur or the proximal portion of the tibia.

The advocates of early amputation in osteogenic sarcoma of an extremity may persist in amputating as early as the third month after the onset of symptoms if the patient is between eleven and twenty years of age and has a lesion at the distal portion of the femur or the proximal portion of the tibia. In any other instance they can offer no tangible hope of success and should therefore agree to delay of amputation which does offer hope of success.

During the delay the best treatment is undetermined but the following are recommended:

- 1 Radiation
- 2 Excision and radiation
- 3 Excision and implantation of bone graft or chips, with or without radiation

If excision is used, it should be repeated if recurrence becomes evident before amputation is performed. The interval between the last excision and amputation should not be less than three weeks and should probably not exceed two months.

The optimum time for amputation is a quiet period in the course of the disease—a period when the patient is not losing weight, when the blood phosphatase is not elevated, and when there has been no sudden or marked increase of mass or destruction demonstrable roentgenographically.

PAUL C. COLONNA, M.D.

Palma, E. C. Shoulder Sprains with Lesions of the Coracoclavicular Ligaments (Esguince del hombro por lesión de los ligamentos coraco-claviculares). *Bol. Soc. de ciruj. de Montevideo*, 1940, 11 33.

The author describes in detail the clinical manifestations of shoulder sprains with lesions of the coracoclavicular ligaments and points out the great similarity to fracture in the external third of the clavicle without displacement. In 3 of such cases the author noted the same history of sudden pain in the shoulder and loss of function interfering with work, even very small movements at the shoulder joint were impossible. There was pain on palpation of the shoulder joint in the region of the external third of the clavicle. Pain was most pronounced on abduction of the arm, and less on anterior motion. Movements of circumduction were impossible. Roentgen-ray examination in all 3 cases showed no changes in articular relations, and no fractures. The most painful point on palpation of the shoulder was over the coracoid process. The acromioclavicular articulation showed no signs of luxation. The course of the condition in these patients was favorable although pain and disturbed function lasted for some time. The author explains all of the symptoms by the trauma to the coracoclavicular ligament.

The author presents a detailed clinical report of an automobile injury to the left shoulder sustained by a twenty-eight-year-old man. There was immediate intense pain, and loss of motion in the injured shoulder.

swelling, infiltration, or deformity was noted. On palpation of the shoulder joint most pain occurred in the external third of the clavicle especially in the infracavicular fossa. Roentgen-ray study sixteen hours after the injury showed no fracture or dislocation. The author injected 25 c.c.m. of 3% per cent novocaine in and around the insertion of the coracoclavicular ligament. There was immediate cessation of pain and restoration of motion. There was rapid functional recovery after this.

This syndrome of trauma to the coracoclavicular ligaments has hitherto received scant attention in the literature, which has emphasized chiefly acromioclavicular lesions. The author notes that the coracoclavicular ligaments are more important for the stability and movement of the scapula and clavicle than the acromioclavicular ligaments. He quotes Liberson who reported 36 such cases and who notes that the coracoclavicular ligament is more important than the acromioclavicular ligament for the function and stability of the shoulder joint.

The treatment depends on the severity of the process. Immobilization and elevation of the arm by a bandage temporarily relieves the patient by relaxing tension on the ligament. Leriche's treatment by infiltration with novocaine gives excellent symptomatic and functional results. In cases with severe tears of the coracoclavicular ligament surgical repair may be necessary. Some authors maintain that even in acromioclavicular luxations surgical repair of the coracoclavicular ligaments is most important for a successful result.

JACOB E. KERN, M.D.

Koester J. Experimental Studies of Nutritional Disturbances of the Meniscus (Experimentelle Versuche ueber Ernahrungsaestörungen der Menisken). *Arch f Klin Chir* 1940, 99: 49.

Meniscus injuries may be divided into two large groups: the acute, traumatic lesions, and the chronic injuries, such as occur in occupational disease, in which previous trauma cannot be demonstrated. The causes of recognized pathological-anatomical changes in the menisci are easily demonstrated in the first group: direct or indirect forces may act to produce uncoordinated knee joint motion which, by exceeding the limit of elasticity leads to tearing of the meniscal tissues. However it is more difficult to explain the often purely degenerative changes as seen in the second group: very often grossly visible intrinsic lesions are lacking in this respect.

A study of the blood supply of the meniscus is of vital importance for an understanding of the development of these chronic lesions. According to experimental investigations of the thoracic blood vessels which branch off from the knee joint arteries pass radially from the joint capsule for the entire perimeter of the meniscus. However they supply only the peripheral portions of the fibrocartilage; the inner central portion is avascular and is nourished by diffusion from the synovia. In certain occupations in which meniscal damage is seen frequently work is performed in an extreme squatting position,

whereby the meniscus is compressed and its blood supply probably embarrassed.

In order to determine the rôle which each factor—blood and synovia—played in the nutrition of the meniscus, the author made the following studies:

If ligated the afferent vessels to the meniscus so that the blood supply as practically obliterated nourishment could then come from the synovial fluid only. The animals were killed after two, seven, and fourteen weeks. Abnormal changes were found only in the last group, and then in only one of the 3 dogs. Widespread degeneration was observed in the tissue of the meniscus with fissures and separation of the fibers, as well as necrotic foci. The lateral meniscus with its undisturbed blood supply remained completely intact.

The author believes on the basis of the foregoing proof—although admitting the doubt which may arise from the use of so few experimental animals—that synovial fluid and lymph are not enough to guarantee the nutrition of the meniscus. Disturbance of the blood supply leads to degeneration not only in the vascular but also in the avascular part, and also leads to necrosis of the tissues, without an antecedent traumatic separation of the tissue. Meniscus lesions in the knee joint lead also to capsular redundancy and to hypermobility of the meniscus; they predispose to disturbances of the nutrition which may produce mechanical damage. If an operation one ligates the nutrient vessels to the meniscus, the fibrocartilage must be resected, even though it be found in an undamaged condition.

(G. BRUN) JACOB G. FINKE, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

De Araujo, A. Autoplasty of the Elbow (Reconstrução articular autoplástica do cotovelo balanceado). *Arb braz de orthop traumatol* 1940, 3.

De Araujo discusses the treatment of traumatic lesions of the elbow complicated or not by suppurating arthritis, and tries to demonstrate the great advantages of subperiosteal resection over rhectomy. The relatively high percentage of balancing elbow following resection does not decrease the value of the method, as various factors may influence the result, such as the extension, nature, and gravity of the lesion; copious suppuration; faulty performance of the surgical act; both technically as well as technically and postoperative neglect. In addition, it is not uncommon for a balancing elbow to represent the result of an operative resection which has avoided the misfortune of an amputation. On the other hand, it should not be forgotten that even arthrotomy and the simple cleaning out of the site of the lesions may result in a balancing elbow.

The author discusses the orthopedic surgical methods and their respective indications in the treatment of the disorder: physical therapy

measures, massage, exercises to promote functional re education, orthopedic apparatus, and the most varied surgical interventions, such as capsulorhaphy, myoplasty, osteosynthesis, arthroplasty. Invariably he uses physical therapy, even as a pre-operative means to prevent undesirable sequelae, and he has always obtained excellent results in cases of semibalancing elbows. In true balancing elbows, he studies the problem of the apparatus needed, that of arthroplastic reconstruction, and that of ankylosis, and he shows that an ankylosis in semipronation and extension of 110 degrees constitutes an appreciated therapeutic solution because it allows the patient to make good use of his extremity.

Of the 11 cases of balancing elbow which he has treated, 10 were due to traumatic lesions and 1 was the result of a resection for tuberculous arthritis. Two were treated with complete success by physical therapeutic measures, 2 showed considerable improvement after the patients refused to submit to a proposed plastic operation, 2 were subjected to a capsuloligamentous reconstruction, with excellent results in one and satisfying results in the other. In 1 case amputation was indicated because of the gravity of the trophic disturbances, in 2, osteosynthesis was performed with kangaroo tendon and good bony ankylosis was obtained, in another, osteosynthesis was done with a bone graft. In the remaining case, which is described in detail, the author performed an articular autoplasmic reconstruction, his technique has allowed him to create a new humero-antibrachial joint having as a posterior point of support a bony protuberance established above a depression excavated on the anterior aspect of the humerus. The good results of this intervention have persisted for four years and the patient has developed a stable and highly efficient elbow in the meantime.

RICHARD KEMEL, M D

Burman, M S Vitallium-Cap Arthroplasty of the Metacarpophalangeal and Interphalangeal Joints of the Fingers. *Bull Hosp for Joint Dis*, 1940, 1 79

In arthroplasty operations of the small joints of the hand or digits autoplasmic material such as fascia, fat, periosteum, or tunica vaginalis has been used. The end-results of the operations have been variable. In civil life these operations are seldom performed because good results cannot be assured.

The successful use of the vitallium cap in arthroplasty of the hip joint suggested its use in arthroplasty of the smaller joints of the hand and digits. Two cases so treated are reviewed. In the first an ankylosed metacarpophalangeal joint of the right ring finger was repaired by placing a vitallium cap, 12 mm in diameter, over the head of the fourth metacarpal bone after removing the bony block. A good result was obtained and the patient was able to flex actively 100 degrees and extend to 160 degrees. The joint was stable.

Following an infection the patient in the second case had an ankylosis of the right middle finger at

the proximal interphalangeal joint but the flexor and extensor tendon mechanism was intact. At operation there was a partial bony and fibrous ankylosis of the interphalangeal joint, while the flexor and extensor tendon mechanism was intact. The joint was freed and a vitallium cap, 10 mm in size, was fitted over the end of the proximal phalanx. The base of the second phalanx was made concave. The wound was closed and the finger immobilized in a banjo traction splint for twelve days. The end-result, three months later, showed active flexion to 90 degrees and extension to 175 degrees and the joint was stable. There are excellent photographs showing the results of these cases in the original article.

The technique of the operation is described. The vitallium is placed over the head of the bone as a thimble, after the bone is shaped and smoothed. No cap is placed on the base of the adjoining phalanx. The cap must be placed in line with the shaft of the bone, obliquity being avoided. The finger is immobilized in a traction splint for twelve days and the patient is encouraged to use the finger as early as possible. The same principles which are used as a guide in the performance of an arthroplasty prevail here as elsewhere in the body.

HARVEY S ALLEN, M D

Milch, H The Bifurcation Operation. *Surveys*, 1940, 8 686

The bifurcation operation has been recommended for pseudo arthrosis of the femoral neck, irreducible dislocations of the femoral head, upward dislocation of the femoral shaft following destructive epiphysitis, fractures of the acetabulum, non-united fractures of the femoral neck, and painful coxarthrosis in which ankylosis has not occurred.

In essence, the operation constitutes an effort to shift the body weight, so as to restore stability without sacrifice of the mobility of the hip joint. Although the procedure makes no attempt at restoration, either of the normal anatomy or physiology of the injured hip joint, there is no doubt that it does succeed, in many cases, in rehabilitating the functionally incapacitated patient. It is a relatively simple technical procedure, which can be quickly performed with but little shock. It reestablishes stability in the unstable hip joint. It relieves pain and permits of at least partial physiological rest to an inflamed or otherwise irritated joint.

The objections are development of postoperative knock knee deformities, loss of configuration and stability in children, interference with mobility of the hip joint, and associated pain.

The first two objections can be overcome by supracondylar linear osteotomy and repetition of the bifurcation operation, respectively. The third objection forms the basis for the author's study.

The response of children to the bifurcation procedure is different from that of adults because the position produced by the operation changes in children while it remains essentially the same in adults. During the early period, stability was restored with-

out exception in children. When excessive abduction, unduly prominent spike formation, or improper double contact with the pelvis occurred a marked impairment of gait and even painful limitation of motion were commonly seen, but almost invariably these unpleasant sequelae gradually disappeared as the children grew older. The pain subsided and the gait improved, but all too frequently the previously acquired stability vanished at the same time. When the roentgenographic findings of these patients were examined, it was found that, as the stability disappeared, the femur manifested a typical sequence of variation. Beginning with the characteristic "Y" shape of the Lorenz bifurcation, the femurs assumed the hockey-stick shape of the Schanz osteotomy and tended ultimately toward the original bone shape.

In the instances in which this did not occur it was found that, as in adults, pain and limitation of movement were invariably associated with excessive abduction or spike formation. In the unilateral cases, and in the erect position this interference in motion was marked by tilting of the pelvis. The degree to which such compensation may occur is determined in large measure by the mobility in the opposite hip and the sacrolumbar articulations. When seated, the possibility of pelvic tilt is precluded and the characteristic limitation of movement is readily demonstrable. The patients cannot cross their legs, they have difficulty in putting on shoes or stockings, and they cannot sit on low chairs. However, it is in the bilateral cases that the full extent of the disability becomes apparent. When the abduction of the distal fragment makes an angle with the femoral neck which is greater than the angle of inclination of the outer pelvic wall, the patients can not bring their legs into parallel position for normal progression. As a result, the gait is awkward and may best be described as a twisting waddle, which persists despite a negative Trendelenburg sign. The feet are held everted, and rotation is markedly limited. In addition, the patients not infrequently are afflicted with such pain in the groin that they must upon relief.

In children the disability may disappear spontaneously as the upper end of the femur loses the appearance of bifurcation. When this does not occur and when the spike persists, these young patients suffer the disturbances which are seen in their elders. In these the same tendency toward loss of the bifurcation may be noted occasionally, but the rate at which this change occurs is so relatively slow that more expeditious therapy must be instituted.

These disabilities can be promptly overcome by resection of the spike which is the hallmark of the bifurcation operation. The fact that this can be accomplished with restoration of mobility and without loss of stability seems to indicate clearly that the spike is not essential to the successful outcome of the osteotomy and that, on the contrary, it is the cause of the undesirable effects found almost routinely after typical bifurcation operation.

ROBERT F. MONTGOMERY M.D.

Cole, W. H. The Treatment of Claw-Foot. *J. Am. Assoc. Surg.* 1920, 893

True claw-foot is due to a lesion of the spinal cord, usually spina bifida occulta or poliomyelitis, the result being a weakness of certain muscles of the foot. The deformity is largely if not entirely one of the forefoot. The forefoot drops because of an ill-defined weakness of some of the muscle groups, and a claw deformity results. Secondary to this there is the typical contracture of the toes which, except in long-standing severe cases, disappears when the claw is obliterated. All grades of claw are seen, ranging from those of such slight degree that a distinction between a deformed foot and a simple high arch is difficult, to those advanced cases in which there are large calluses or even ulcers under the heads of the metatarsals, marked cocking of the toes with a location of the metatarsophalangeal joints, and an excessive degree of claw with extreme contracture of the plantar structures. Individual bones of the foot may become intrinsically deformed and a true bony claw exist. Although many cases tend to progress, there are stationary cases of all grades, and the better results, following any but the most radical treatment, are probably in this group.

The object of ideal treatment is to correct the claw and prevent its recurrence. By systematic treatment some cases can be checked and others corrected so that good functional feet are obtained. It must be remembered that many persons with the milder degrees of claw go through life with little trouble other than the use of extra caution in the fitting of their shoes. It is when the contractures are such that the feet become painful and calluses develop under the heads of the metatarsals and over the contracted toes, that real crippling occurs.

Several forms of treatment for the various stages are used; they include daily repeated manipulations with flattening of the arch and stretching of the plantar structures, exercises to strengthen the dorsiflexors of the foot without cocking of the toe for the use of an anterior arch bar in the shoe or better yet, an insole with an anterior bar incorporated to fit the use of a night splint, which also has bar to keep pressure back of the metatarsal heads and thus counteract the claw-forming forces. In more advanced cases closed and open plantar fasciotomy followed by plaster casts may be indicated.

In a majority of the more severe claw feet more operation is needed to prevent recurrence of the deformity. Transplantation of the toe extensors to the cuneiform bones will aid in keeping the arch flat and preventing progressive claw. The author advocates a modified Hibbs procedure or transplantation in which the tendon of the extensor hallucis longus muscle and the four tendons of the extensor digitorum longus muscle are placed into the cuneiform bones so that their pull efficiently reinforces the tendons anterior in doming the arch. After removal of the long extensors from the toes, the smaller toes function sufficiently well, but the great toe will drop; therefore, the interphalangeal

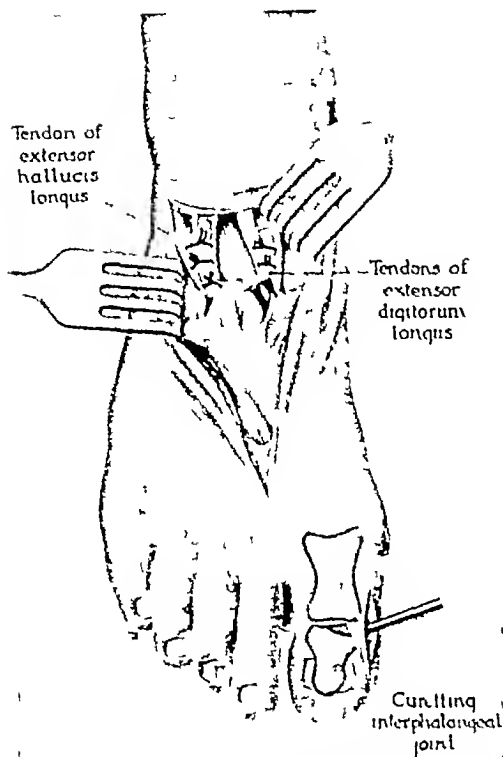


Fig 1 The tendons have been passed through the tunnel in the cuneiform bones, the extensor digitorum longus bundle from the lateral to the medial side, and the extensor hallucis longus in the opposite direction. The tendons are held in place by interrupted sutures, the distal one on each side passing through the perosteum. Through a small medial incision the interphalangeal joint of the great toe is curetted in order to initiate ankylosis.

joint of the hallux must be immobilized. A tenodesis of the distal stump of the extensor hallucis longus into the first metatarsal is sometimes used in place of the arthrodesis, but the latter is to be preferred in patients more than ten or twelve years of age. The postoperative plaster dressing is removed after six weeks and active physical therapy is started. Weight-bearing is allowed in a shoe with an anterior bar in the insole with an anterior heel or its equivalent.

If bone deformity of any marked degree is present, the cavus cannot be corrected by releasing of the plantar structures and wrenching of the foot. It is then that removal of a wedge of bone is indicated as the only possible way of making the foot symptomatically less disabling and anatomically more normal in appearance. When wedge osteotomy is necessary to overcome the cavus, an anterior tarsal wedge will save function, and correct the deformity. The postoperative short leg plaster cast is worn about eight weeks, then weight-bearing without support can usually be started.

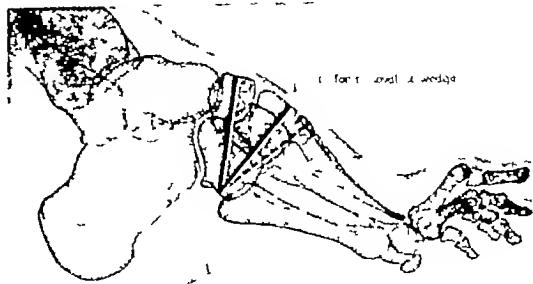


Fig 2 A diagrammatic representation of the foot to show location of the wedge in anterior tarsal wedge osteotomy. Note that the proximal cut is anterior to the midtarsal joint.

It will be found that with correction of the cavus the toes will straighten out. It is only occasionally that any direct attention need be paid to them, although some hammer toes will have to be taken care of in older persons. Callosities disappear when their cause is removed, but at times the use of salicylic-acid preparations will be necessary to hurry the convalescence. The tendon transplantation described may occasionally be indicated after this osteotomy.

ROBERT P. MONTGOMERY, M.D.

FRACTURES AND DISLOCATIONS

McKinnon, S. D. Fractures—Elastic Band Traction. *Canadian M. Ass. J.*, 1940, 43, 324.

The use of elastic bands as a traction force in the treatment of fractures has been limited generally to those involving the phalanges and the metacarpals. However, during the past eight years the author has extended the use of elastic band traction to fractures of other long bones, first, as an emergency measure, and, later, as a procedure that has become almost routine. In as much as simple fractures of the humerus, of the radius and ulna, and of the tibia and fibula seldom require traction, this method has been found most applicable to certain compound fractures of the afore mentioned bones and to simple and compound fractures of the femur. The method differs only from those in common usage in that the "pull" is obtained by elastic bands under tension. The advantages offered by this method arise from the use of a mobile unit splint-traction device. Elastic bands cut from discarded automobile tubes in widths of one quarter, one-half, and three quarter inch are used.

In younger children a general anesthetic is given. Obvious shortening and deformity is corrected by manual traction, the leg is properly cleansed, elastoband strips are applied in the usual manner and fixed to a frame spreader. Elastoplast is used to fix firmly the elastoband to the thigh and leg, that applied to the thigh exerting slightly more than a moderate degree of compression. A well fitted Thomas splint is

then slipped on and the supporting bands are attached in the usual manner. An elastic band of suitable "pull" is selected, and, with one or two ply of the band, the spreader is attached to the distal end of the splint. Tension of the elastic band is set at a point designed to produce a degree of traction which will effect and maintain reduction. This produces a unit splint traction device which enables transportation of the patient. In older children the anesthetic may be dispensed with or local anesthetic is used. Occasionally skeletal traction may be necessary. In adults skeletal traction is the method of choice. The supracondylar site is usually chosen for bone traction. Elastic traction is made from the stirrup to the end of the Thomas splint. The unit traction-splint may be suspended to an overhead frame.

The author claims that this method of treatment offers the following advantages: low cost, easily improvised equipment of light weight, and unit splint traction apparatus facilitating transportation and aiding nursing care, especially in compound fractures.

F. HAROLD DOWNING, M.D.

Winterstein, O. Unexpected Discoveries with Regard to the Phases of Torsion Fractures (Unerwartete Ergebnisse über die Ebenen der Torsionsfrakturen). *Zeitschr. f. Unfallmed. u. Berufskritik* 1940, 34, 64.

In the recent fracture material of the University Clinic at Zurich the author studied the comparative incidence of different fracture planes. This has hitherto never been considered in the literature. One hundred and forty-eight torsion fractures are considered. Among these there were 1 spiral fractures of the lower leg, 40 from winter sports, 27 from traffic accidents, and the rest from other common causes. Seventy-seven were rotated outward and 33 were turned inward. The mechanism of the sports injuries is the least difficult to explain: the fractures are, as a rule, turned outward. Outwardly rotated fractures also predominate in traffic accidents. Reconstruction of the events of the accident from the roentgen film is of value in checking the statements of the injured and of the witnesses. The typical site of the outward rotation fracture is in the distal half of the lower leg. The majority of the inwardly rotated fractures, however (by ratio of 1:1), are in the proximal half of the lower leg. Theoretically the fibula should be fractured further proximally in outwardly rotated fractures and farther distally in inwardly rotated fractures. There are many exceptions to this.

Twenty-three spiral fractures of the upper leg were divided evenly between sport and traffic accidents. With regard to the mechanism of injury considerations analogous to those in the lower leg hold true for the upper leg. The torsion is carried over into the femur by the fact that at the second of the impact the knee is held completely stiff by maximum muscle contraction, and the twisting force operates through the bent knee on the femoral condyles. In 7 cases the torsion was inward. The

localization of these fractures—as predominantly in the midshaft; in second place was the proximal third, and in last place the distal third. The explanation is in the strength of the cross-sections of the bone.

The striking frequency of inward rotation fractures is explained by the greater resistance of the stout fibular collateral ligament to force applied when the foot is inwardly rotated and the knee extended. In case of a fall with the knee bent the held fast as a support. The least undesirable result of this is that the lower leg and foot are forced backward and outward. Thus the upper leg comes to internal rotation. Falling forward or twisting the body toward the breaking leg contributes to the inward rotation fracture.

One-half of 15 torsion fractures of the upper arm were outwardly rotated, and one-half inwardly rotated. The great freedom of the shoulder joint makes that understandable. Midshaft, distal, and upper third is the order showing the frequency of the fracture sites.

The knowledge of the course of the torsion plane is important in treatment, particularly with regard to the possibility of secondary displacement. (HEDENRUBEN-GARTNER). RICHARD WINTER, M.D.

Schede, F.J. Results of our Treatment of Congenital Hip Luxation. (Die Ergebnisse unserer Behandlung der angeborenen Hüftverrenkung.) *Zeitschr. Orthop.* 1940, 7, 3.

This report covers the investigations of the last fifteen years. The conception of cure according to Lange and Kretz is given in abstract. A hip joint is cured anatomically when it appears absolutely normal in the roentgenogram, and shows the superior part of the articular cavity to be fully developed, with completely congruent spheric terminal surfaces of the head and of the articular cavity and entirely normal articulation with ability to carry the body weight. Joints showing this result belong to Group I.

Functionally cured joints, although functioning well, show distinct deviations from the norm in the roentgenogram. These belong to Group II. Group III represents imperfectly formed articular joints and femoral heads as well as malformations of the femoral necks, inasmuch as function is not materially impeded by them. Group IV represents the serious malformations with distinct functional disturbances.

The condition of the joint four to five years after reposition is called the primary result of the cure, and this remains unchanged, as a rule, until the beginning of puberty. We speak of the end result only after development is complete, since some cases show change for the worse during puberty. It is asserted that patients who have recovered perfectly from an anatomical point of view during the first four years are much less subject to a change for the worse, so that anatomical cure is synonymous with permanent cure.

Early treatment and correct after treatment are essential for an anatomical cure. A subsequent

change for the worse in a primary anatomically cured joint has not been observed. In a critical review of the reports on treatment which are at hand, we are warned of exaggerated pessimism. Progress in therapy is impossible without a certain amount of unswerving optimism.

Among 74 cases in which replacement was done from 1924 to 1929, more than half of the unilateral luxations belonged to Group I and of the bilateral luxations, more than one-quarter. Group IV was represented by 28, i.e., 77 per cent. All patients belonging to Group I have passed through puberty without damaging effect. One fact appears certain, namely, that the primary anatomically cured joint is more permanently cured than the functionally cured one. End-results will therefore become more satisfactory if the number of primary anatomical cures can be increased. It is generally known that *early treatment* is of the greatest importance. By this is meant treatment in the first year of life. Early diagnosis is taken for granted. The helpful suggestions of Hilgenreiner are dependable and indispensable. When the tendency to luxation appears evident, some kind of abduction treatment must be introduced immediately. In case of diagnosed luxation simple abduction treatment is insufficient, and correct reposition is necessary, preferably under anesthesia. Fear of trauma following reposition is unfounded, because it plays no part in a subsequent head deformity. A plaster cast is always the best means of retention. It must fit very snugly around the trochanter, but may be loose otherwise. The duration of the plaster-cast treatment in the first year of life has been reduced to two months. For the sake of keeping the child clean while in the cast, the bivalved plaster cast is essential because it is the only means to assure dependable support, and also because the joint which appears to be normal usually is also affected.

One of the main achievements of the last decades which had for its purpose the primary anatomical cure is the functional after-treatment. Preliminary treatment for recasting of the joint deformed by luxation consists of reposition and retention, to be followed by after-treatment. The purpose is (1) ossification of the upper portion of the articular cavity and deepening of the cavity, (2) transformation of the femoral head from a flattened to hemispherical shape, and (3) lowering and torsion of the femoral neck. Development depends on the congenital malformation and also upon the function. The effect of the first cannot be evaluated, but function can be accurately apportioned.

According to Murr Jansen's law of the vulnerability of rapidly growing cells, the effect of stimulus through pressure and articulation varies with the age of the patient. With regard to their intensity, pressure and articulation must be accurately graded in order to be of optimal effect. Both insufficient and exaggerated stimulation may become dangerous. A certain percentage of the occurring disturbances in the development of the reposed hip joint can be

avoided, particularly those which are caused by the seriousness of secondary changes already present (reposition done at an advanced age), and those which are caused by a faulty mechanical stimulus.

Regarding the possibility of predicting the developmental process, the author has been entirely misled by the study of end-results. Hilgenreiner's stigmata are not dependable. The question whether developmental disturbances are endogenous or functional cannot be answered as yet. To do this we need material taken from the first year of life which is still free from secondary changes. In addition to the individuals with true congenital luxation there is a larger group which merely show a congenital susceptibility to luxation. It is possible, therefore, that the susceptible joint may become dislocated, may remain flat without clinical manifestations (functionally normal), or show subsequent regressive transformations and very late manifestations (*malum coxae*). Premature osteosclerosis of the roof of the articular cavity appears, if at all, during the first two years after reposition. It may be endogenous or exogenous and offers an unfavorable prognosis. It should be treated early by means of plastic operation. The so-called osteochondritis of the upper femoral head is not an illness nor a result of trauma following reposition, but merely a roentgenological sign of the functional transformation. In cases in which transformation remains stationary, i.e., when the formation of a new head fails to be accomplished, or if the new head remains flat, broad, and irregular, the procedure must be diagnosed as pathological. During puberty which offers conditions similar to those of the first years of life, the reposed hip joint is again seriously endangered. Treatment must be the same as in the case of infants: abduction, outdoor treatment, anti-rachitic measures. This should be continued over a period of six months. The most intensive and rapid transformations have been observed during this revolutionary developmental crisis. Surgical reposition is rarely used because the mechanical device of Weber's luxation table which is used in difficult cases has always made reposition possible except in 5 cases. Beginning with approximately the seventh year, reposition should not be attempted any more. Exceptions confirm the rule. At this point plastic surgery of the articular cavity is indicated, and it can be resorted to without hesitation even after the thirtieth year.

The author has included a number of excellent and highly interesting roentgenograms and a complete bibliography.

(HACKENBROCH) HILDA H. WULLEN

Felsenreich, F. *Histological Studies of Cases of Operated Fractures of the Femoral Neck. The Phenomena Occurring in Bone and Cartilage following Bone Necrosis* (Histologische Untersuchungen an operierten Schenkelhalsbrüchen. Die Vorgänge am Knochen und Knorpel nach Knochennekrose). *Arch f klin Chir*, 1940, 198: 532.

The author enhances his eighth report concerning histological studies of cases of the femoral neck.

which have been operated upon with numerous impressive and clearly described photomicrographs and roentgenograms. After a comprehensive review of the literature he discusses the reorganizing phenomena following bone necrosis in the femoral head on the basis of a microscopic study of 14 specimens, obtained more than two months following operation. He recognizes zone-like revitalization, "concentrically superimposed layers upon the necrotic bone, and reorganization of the dead bone which appears to be typical in conjunction with simultaneously existing osteomalacia. In the first form, similarly to Freund, he found 4 zones: (1) a wall of fibrin, as indication of an aseptic inflammatory reaction of the infiltrating tissue to the necrotic fatty marrow; (2) zone of fibrous marrow with lacunary bone absorption; (3) a zone of concentrically disposed layers of tissue; and (4) zone of final bony metamorphosis into sclerotic or porous bone depending on the functional demand. The microscopic changes within these zones are described and the course of the revitalizing processes are reconstructed on the basis of the studies made.

In this zone-like reconstruction there occurs a poorly developed layer within the fibrous marrow with which the hypercalcemic zone of reconstruction is continuous. In the second form of the concentrically superimposed tissue there is reconstruction process in which, because of the peculiar general or local circumstances, a large amount of the new bone tissue is formed, just as in the zone-like revitalization of the bone, without the occurrence of any extensive resorptive phenomena. In other words, the resorptive phase is lacking. It is in this remarkable manner that hypercalcemic bone is exclusively formed, which everywhere retains necrotic bone tissue within its intertrabecular spaces. In the third form, the necrotic bone, depending upon the stage of the osteomalacia just as in concentric superimposition, is finally covered either by osseous or calcium-containing bony layers which are easily recognizable because of the abundant cementing lines. Because of the marked hyperemia of the marrow the process later progresses to cavitation of the more centrally located necrotic trabeculae by fibrous marrow and blood vessels, and these spaces then become lined by osseous tissue. Thus, frequently pipe-like arches similar to the spongiosa tubulosa are formed, which in this instance may be considered as indicative of bone reconstruction under the influence of functional irritation following necrosis. In the reconstruction of the cortex, phenomena occur which are similar to those in the reconstruction of the spongiosa. Here also are found "zone-like revitalization as well as the concentric deposition of tissue and the typical reconstructive processes of osteomalacia.

Whereas in the first two forms, for the most part, a weight bearing structure develops, this is not the case in the last form because the continuity of the cortex is disturbed as a result of the reconstructive processes. Deep layers of cartilage, and zones of

calcification and general lamellae are destroyed because the cortex, in the course of reconstruction, extends deeper toward the marrow. The connection between the cartilage and the new cortex does not occur over a continuous bony surface but rather by means of individual columnar projections, as a result of which the firmness of the cortex is diminished. Secondly occurring necrotic foci following introduction of second nail undergo reconstruction like the primary foci. The age of the foci can be easily recognized by the conditions found in the spongiosa.

The injury of the cartilage takes place in the same way that vascular bony injury occurs. The changes which take place in the cartilage during the morphological changes of the bone are, therefore, reparative processes, just as Axhausen assumed them to be, in recent distinction to the views of Pommmer. He called them an osseous form of arthritis deformans. The functional condition of the cartilage is variably influenced by the nutritive disturbances, which depend upon the position of the fibrous portion. The conclusion that we almost always find a proportionally severe damage of the cartilage after prolonged continuous ischemic damage of the bones appears of importance. It is demonstrable (by staining) that the cartilage repair processes become recognizable much later than do those of the bone. This is probably to be explained by the fact that in total subchondral necrosis and long lasting circulatory disturbance, enduring for weeks and months, the cartilage is no longer able to recuperate. However, a transitory ischemia, on the other hand, hardly affects the cartilage. Even very delicate fractures may be able to sustain the vitality of the entire cartilage or at least of its major part. This fact confirms the assumption that the cartilage is extensively dependent upon the subchondral vascular network as far as its nutrition is concerned.

The genesis of delayed fractures is discussed on the basis of an extremely instructive case. Numerous proofs exist that after certain period of time the bone will undergo fracture of its superficial surface in the region of the completely necrotic bone. The process, according to Axhausen, may be attributed to the physical changes of the collagen fibrils. Such fractures take their origin frequently from the weak points of the surface of the femoral head. The fractures occur in series, and occasionally revitalization may occur between these different series of fractures. The reparative structures formed during such periods of convalescence can later again undergo necrotic changes after new fractures set in. Should this process take place on the superficial surface of the femoral head, it will result in a capital deformity. Should this process, on the other hand, take place near the fracture line surfaces, it will result in resorption of the head and neck. The loss of these fractures frequently extend into the revitalized zones and finally find their termination in the region of the fibrous marrow zone, where the spongiosa has been made susceptible to spontaneous

fractures because of resorption. Occasionally the fracture line at this point will undergo a deviation of its course and continue on in a more transverse direction toward the cortex. This deviation of the course of the secondary fracture lines is brought about by the hypersclerotic zone of bone reconstruction, which hinders the further progress of the spontaneous fracture. In the fibrous marrow zone itself, such secondary fractures heal by hypertrophic callus formation (hard connective tissue, cartilage). Those places where an impaction of the broken trabeculae has occurred usually heal by means of bony repair. The hypertrophic, callous soft-tissue formations choke off the marrow spaces and thus hinder the reconstructive process in the remainder of the femoral head. Thus, one can observe bony healing in the secondary fractures next to reparative structures similar to pseudarthroses.

Of the various processes described in the histological picture, the following are accompanied by roentgenograms: (1) secondary fractures of the cortex within bone of normal structure with simultaneous resorption of the head and neck, (2) zone-forming reconstructive processes, (3) diffuse sclerosis of sagittal sections of the cranial portion of the head of the femur which had formerly been necrotic but had undergone reconstructive processes accompanied by mild changes in the form of the femoral head, (4) sequestra riding upon the nail which was still present, and (5) healing sequestration following the removal of the nail.

From the studies presented above, the following practical important conclusions may be drawn. Widespread necroses are very common. The reconstructive process requires many months and frequently years for its completion. Its course is dependent upon the vascularization of the surrounding tissues, upon the length of time which has transpired since the injury, and upon the amount of weight-bearing and rest to which the affected region is subjected. Spontaneous secondary fractures are of relatively frequent occurrence. When the conditions are favorable the latter may undergo bony healing, otherwise they undergo healing with pseudarthrosis formation, and even in the most favorable cases will lead to sequestration on the surface of the femoral head and to resorption of the head and neck in the region of the fractured surfaces. The prognosis of the operated cases of fracture of the femoral neck is determined by the various processes described. One is not justified in rendering a conclusive opinion in an operative case after one or one and one half years, but after three years such an opinion may be rendered with greater assurance. Of the greatest importance, it seems, is the fact that the nail, because of its strength and mass, tends to hinder the reconstructive processes within the portion of the femoral head which lies cranio-laterally to it, a portion of the head which *per se* shows a tendency to become the prey of necrosis and remain necrotic for a long time following fracture. For this reason the nail should be removed whenever possible, after

indubitable bony healing of the fracture, in order to make it possible for the living tissues of the caudal portion of the head to grow more rapidly into the necrotic portion. As a result of these studies, post-mortem proof has been brought forward to show that the author's proposal to place the nail in a more caudal section of the head, in order to promote the reconstructive processes of the necrotic cranial portions of the femoral head, is important. Eighteen photomicrographs accompany the original article (TILK) HARRY A. SALZMANN, M.D.

ORTHOPEDICS IN GENERAL

Horwitz, T. Ischemic Contracture of the Lower Extremity. *Arch Surg*, 1940, 41: 945

The author presents 2 new cases of ischemic contracture involving the lower extremities and reviews the 18 previously reported cases in the literature. The 2 new cases are of eleven and fourteen years' duration and present the following features: (1) healed fractures of the femur, (2) massive induration of the muscles of the leg and foot associated with atrophy and loss of motor power below the knee, (3) vascular dysfunction in the involved lower extremity, (4) contractural deformities of the foot and toes, (5) roentgen evidence of extra-osseous calcification of the leg, and (6) histological evidence (in 1 case) of massive degeneration of muscle tissue with fibrous-tissue replacement and extensive calcification. In these cases there was a pathological state in the lower extremity identical with Volkmann's ischemic contracture of the upper extremity.

Its occurrence must be anticipated after fracture or extensive injury to the soft tissues without fracture, especially in the region of the knee and leg. The stage of contracture and deformity may be avoided by fasciotomy during the acute (prodromal) stage. Deformities of the lower extremity consequent on the contractures may be corrected by adequate non-operative and operative measures. The wisdom of fasciotomy during the acute stage, in the lower extremity as in the upper extremity, appears to be substantiated by the recovery and the avoidance of contractural deformities in the case reported by Jones and Cotton, after exposure of the popliteal space and evacuation of its extravascular bloody contents. If the dreaded contracture is to be avoided, pressure must be relieved immediately, as soon as the earliest evidence of impending vascular interference becomes recognizable.

Extra-osseous calcification representing the dystrophic form of pathological calcification is characterized by the deposit of lime salts in tissue of low viability or in dead tissue. Available evidence indicates that this process is associated with vascular deficiency and is dependent on local factors such as the hydrogen-ion concentration and carbon dioxide tension.

A description of the histological features in the acute stage and in the stage of contracture is presented along with photographs, photomicrographs,

which had increased in volume during the presence of the fistula.

6. The temporarily great increase in blood pressure and fall in pulse rate on closure of a fistula are dependent upon an increase in the total blood volume, which is an inevitable accompaniment of a fistula of large size and long duration. One case shows a drop in blood volume from 7,300 to 6,300 c.c.m. after the removal of the fistula, and in another case the blood volume dropped from 5,200 c.c.m. to 4,100 c.c.m. after elimination of the fistula. Both cases showed marked cardiac dilatation and marked effects upon the blood pressure and pulse, upon closure of the fistula.

7. The increased blood volume is reduced immediately following operative removal of a fistula by a reduction in the plasma as shown by the increased urinary output and concentration of the red cells and hemoglobin in the blood.

8. This increased blood volume may result in a transient overdistention of an already dilated heart following closure of a fistula by operation, because of redistribution of the circulating blood, the volume of blood formerly diverted through the fistula into the capacious venous system now filling the central arterial bed.

9. Eight cases of peripheral fistula were eliminated by excision or ligation of the segments of the main vessel to a limb without any evident effect upon the viability of the tissues beyond the ligature. In 1 case the common femoral, deep femoral, and superficial femoral arteries were all ligated without impairment of the nutrition or function of the leg. This is explicable on the basis of the stimulus to the collateral circulation provided by the area of diminished peripheral resistance at the site of the fistula, which attracts blood to it through all available channels.

10. When quadruple ligation of the vessels proximal and distal to the fistula is indicated, it could be desirable to ligate and divide the artery proximal to the fistula rather than to ligate it in continuity. In case, the fistula was resected by the ligature cutting through the arterial wall and thereby reestablishing the lumen of the artery.

Experimentally in the first twenty-four to forty-eight hours after the establishment of a large arteriovenous fistula, the heart diminishes in size; this is followed, if the animal survives, by prompt return to normal, and, subsequently there is a gradual dilatation which may be apparent within four or five days.

Death due to an excessive diversion of blood through the fistula may occur accompanied by a marked diminution in the size of the heart. The dilatation that accompanies an arteriovenous fistula is not restricted to the heart but affects the vessels involved in the fistulous circuit. The same cause is responsible for both dilatations, an increase in the volume or bulk of blood flowing through that part of the circulatory system through which the blood short-circuited by the fistula must flow, namely,

the chambers of the heart, the proximal artery, the fistula, and the proximal vein. In the growing animal, the dilatation and enlargement may be very great without evidence of decompensation and may be accompanied by pronounced hypertrophy. It is suggested that when dilatation outstrips hypertrophy, decompensation occurs. Here dilatation is paralleled by a commensurate hypertrophy, great enlargement and dilatation of the heart may occur without decompensation. In crucial experiment, involving 3 litter mates of equal weight and stature,

acting as control, 1 having an aorta-vena-cava fistula 1 mm. in circumference and having an aorta-vena-cava fistula 18 mm. in circumference, there occurred an increase in blood volume commensurate with the size of the fistula. In the same animals an increase in the capacity of the circulatory system occurred also commensurate with the size of the fistula. The increase in capacity and the increase in blood volume closely paralleled each other. In an animal with bilateral femoral fistulas the increase in blood pressure and reduction in pulse rate were greatest when both fistulas are closed simultaneously, and considerably less when either fistula was closed separately. The physiological effect of a fistula, therefore, clearly depends upon the volume of blood diverted through the fistula and, therefore, upon its size. The transient high systolic and diastolic pressures that persist for several days following operative closure of a fistula are due to the increase in blood volume that has occurred during the existence of the fistula. The permanent elevation of diastolic pressure is secondary to the elimination of an area of decreased peripheral resistance. In animals having bilateral femoral fistulas, venous pressures are highest with both fistulas open, least with both fistulas closed and intermediate pressures are obtained on closure of one or the other fistula separately. Venous pressures proximal to a fistula are determined by the volume of blood diverted through the fistula and, therefore, by the size of the fistula. MAXWELL E. LACROIX, M.D.

Groth, K. E. Tumor Embolism of the Common Femoral Artery Treated by Embolotomy and Heparin. *Surgery* 410, 8 67

An uncommon case of embolotomy of the common femoral artery is reported by the author. According to all experience, occluding embolism of the arteries of the circulatory system resemble each other in two respects: (1) the source, which apart from rare cases of so-called paradoxical embolism is generally the left half of the heart and occasionally the central parts of the aorta and (2) the material in the embolus itself, which usually consists of centrally formed thrombus matter. The case here with discussed differed in both respects: (1) the source of the embolus was undoubtedly the lungs and (2) the embolus consisted mainly of tissue of the lung. Together with the embolus there was extracted a mass of material approximately 8 cm. long.

Repeated arteriotomies and removals of re-formed clots and intra-arterial injections of eupaverin produced only a temporary circulation, and the circulation was definitely restored only when the artery had been cleaned out for the fifth time, followed by an intra arterial injection of heparin. The heparinization entailed no trouble.

The source of the embolism and the treatment are discussed. Embolism in the lower limbs should be subjected to operative treatment, especially if tumor embolism is suspected. The limited clinical experience so far gained with heparinization in cases of embolectomy would seem to promise a better prognosis, there now being better prospects of mastering secondary thrombosis. Cautious heparinization should be performed after each embolectomy. The right moment for heparinization is when the artery has been cleaned and the incision sutured. Pre-operative heparinization should be avoided as it entails unnecessary risks of complications.

General rules for the dosing, based on sufficient clinical experiences, are as yet lacking. It goes without saying that the smallest effective dose must be the aim. In this case, 100 mgm injected intra-arterially proved to be quite effective and entailed no complications. This dose corresponds to a little more than 1 mgm per kgm of body weight. In the event of bleeding locally, a 0.5 per cent thionin solution, which is non-toxic, is recommended. If swabs of cotton wool dampened in this solution and pressed against the bleeding spot do not produce the desired effect, it can be covered with a piece of muscle soaked in the solution, which heals and produces a reliable hemostasis. HERBERT F. THURSTON, M.D.

Smith, S. A Soluble Rod as an Aid to Vascular Anastomosis, An Experimental Study. *Arch Surg*, 1940, 41: 1004.

The feasibility of suturing severed blood vessels has been established by the "auto-hetero" and devitalized vascular transplant work of Carrel and Guthrie. However, the Carrel Guthrie technique of end-to-end anastomosis presents technical difficulties which have discouraged its use except by the surgeon with special training.

It is evident that intravascular thrombosis is the primary factor to be guarded against in vascular anastomosis. Local thrombosis is accelerated by liberation of thromboplastic substance, which, to a large degree, parallels the amount of real trauma to the intima of the vessels. The precautions to be observed, therefore, are:

1. Minimal trauma to the vessels, especially to the intima, by delicate handling.

2. Sutures treated with liquid petrolatum or olive oil (platelets are less apt to stick to oil soaked sutures) should be used and a minimum of the suture material should be exposed to the blood stream.

3. Minimal constriction of the lumen at the site of suture so that, by Venturi action, an increased number of platelets are not brought in contact with the exposed parts of the sutures.

The author has devised a technique based on the use of a soluble rod introduced into the lumen of the severed vessel so that the mechanical form facilitates the proper approximation and suturing of the ends of the vessel. He describes the method of producing a soluble rod, which is as follows:

With the observance of strict asepsis dextrose is heated slowly to 160° C. The slightly caramelized liquid is poured (or sucked) into sterile rubber tubes ranging in inside diameter from 2 to 3 mm. The filled tubes are then cut into segments 3 cm long. These segments are dropped into ether for a few minutes. The rubber softens and swells, which permits the dextrose rod to be slipped out of the rubber mold with ease. The rods are then coated with some substance that will serve to protect the intima from the dehydrating action of the dextrose. Such a substance may be gelatin (3 per cent solution) or an oil which is liquid at body temperature. If gelatin is used, it must be made up in a solvent which is relatively non-solvent for dextrose. Dodecyl alcohol serves this purpose.

The rods may be fastened to needles which serve as handles, and may be dipped repeatedly into warm, sterile gelatin solution until a fairly uniform coating of gelatin is obtained. They are then fastened by means of the handle of the needle to a sterile cork plate in a vacuum desiccator. A partial vacuum is created. The gelatin coat dries in two or three days.

An alternate and simpler method, more recently used, is to coat the rods with an oil which, in the amounts used (0.02 cc), probably presents no practical dangers from oil embolism. For this purpose theobroma oil U.S.P. (cocoa butter) is blended with some other fat, with wax or with paraffin (with a higher melting point). Theobroma oil U.S.P. (75 per cent) and paraffin (25 per cent by volume) produces a blend which liquefies at body temperature. The rods are dipped into sterile solution once, fastened immediately to a sterile cork plate in a desiccator, and stored until used.

After describing the method of producing a soluble rod, the author gives his technique of suturing over this soluble rod. The soluble rod goes into solution very shortly after the circulation is re-established through the repaired artery. PAUL MERRELL, M.D.

BLOOD, TRANSFUSION

Scudder, J. Studies in Blood Preservation. *Ann Surg*, 1940, 112: 502.

The author notes that for over a century interest has centered in the preparation of an artificial fluid medium which could be used for perfusion experiments. Today, the increasing interest in plasma transfusions signifies a nearer approach to this ideal. The advantages of plasma are many.

It is a more stable system than blood, because of its buffer capacity, it is superior to acacia, glucose, and salt infusions. Its ionic content is of physiological proportions, it contains certain organic substances necessary for maintaining protoplasmic irri-

stability and, in addition, it possesses proteins which are concerned with innumerable functions of the body economy.

The progressive deterioration of preserved whole blood has become apparent. On the other hand, the stability of preserved plasma is now recognized.

In a comparison of plasma with blood substitutes, it is noted that the plasma is non-antigenic. Repeated plasma transfusions have been given without anaphylactic reactions. Thus, plasma may be safer than blood. Plasma is less toxic. There have been many α toward reactions with serum. The reactions become graver with the use of heterologous sera. What gives rise to this difference between serum and plasma is not known.

Another advantage of plasma is that it can always be kept on hand for emergency use. While whole blood deteriorates rapidly plasma has been preserved in storage for months. The desiccation of plasma by the lyophilic process may extend the period of preservation for years.

The purpose of the investigation reported herewith is to reexamine these plasma proteins, and to ascertain which factors govern their stability and enhance their preservation. The electrophoretic method of analysis for proteins was used in this study. Refrigerated plasma samples of varying ages were obtained from three different blood banks in New York City. In addition, unrefrigerated samples were examined, as well as placental plasma obtained from uterine rooms. A specimen of dried serum prepared by the lyophilic process was studied also.

In preserved plasma the greatest change appears as a decrease of albumin, as well as an alteration in the components which constitute the albumin-globulin ratio. Fibrinogen appears unaltered. A definite increase appears in the gamma globulin. In comparing the refrigerated samples with those that had been kept at room temperature and had been shipped about the country the greatest difference is seen in the beta-globulin fraction. Both the uterine serum from the child and the plasma from the adult were abnormal. The placental plasma appeared within normal limits. The lyophilized serum presented an anomaly—beta disturbance was missing.

While no conclusions can be drawn from this small series, certain indications may be mentioned.

First, as to the source of the preserved blood, post-mortem blood appears abnormal; this may not apply to those who have met sudden death. Placental blood would appear to be normal source for conserved blood. Lyophilized serum appears abnormal. Refrigeration seems to enhance the preservation of plasma as did the shape of the flask.

HARVEY F. TUCKER, M.D.

Dobash, J., Clegg, O., and Vaughan, J. Changes Occurring in Blood Stored in Different Preservatives. *Brit M J* 940, 433.

The authors present a report of an investigation made to study the changes that occur in certain elements of the blood stored in different preservatives.

The following characteristics were initially chosen for analysis: (1) total red-cell count and red-cell fragility in hypertonic saline solution; (2) total white-cell count and differential count; (3) platelet count; (4) sedimentation rate; and (5) coagulation time.

After a few observations it was found that the most striking effect of changing the preservative was upon the red cells. Therefore in subsequent examinations, the red cells only were studied.

The solutions used as preservatives were: (1) saline citrate solution; (2) the same saline citrate with the addition of 3 per cent glucose; (3) and (4) both of the above solutions fully oxygenated; (5) the saline citrate solution with 3 per cent glucose; (6) the saline citrate solution with 6 per cent glucose; and (7) caramelized 3 per cent glucose saline citrate.

The sedimentation rate is retarded in stored blood. This appeared to be slightly less definite in solutions containing glucose. The polymorphonuclears were completely absent after ten days in all samples, disappearing in the majority of cases by the seventh day. The platelet count fell on storage, but after the end of the second week a fairly constant count of 40,000 per cmm. was still present, both in the saline citrate and in the glucose-saline citrate. This result is not in agreement with those of previous observers who state that no platelets are found at the end of fifteen days. There was steady decrease in mean corpuscular fragility in all solutions hitherto investigated, but it was most marked in those which did not contain glucose.

In solutions that do not contain glucose the red-cell count falls below 3,000,000 per cmm. at approximately the end of the second week. In solutions containing glucose up to 3 per cent the count is maintained at the 3,000,000 level in some instances for longer than a month.

In concluding, the authors state that glucose in a final concentration of 1 per cent and 3 per cent favors the preservation of red cells in stored blood through its effect on red-cell fragility. Red-cell counts on stored blood must be made by using plasma as the diluent.

HARVEY F. TUCKER, M.D.

Levinson, S. O., Rubowitz, F. E., and Necheles, H. Human Serum Transfusions. *J Am M Ass* 940, 563.

One of the fundamental requirements in combatting shock is restoration and maintenance of adequate volume of the circulating blood. Whether shock is primary or secondary whether due to hemorrhage, trauma, or toxic substances, it is generally believed that there is resultant diminished circulating blood volume and decreased peripheral blood flow. The presence of dilated and more permeable capillaries, there is progressive blood stasis and subsequent loss of plasma into the tissue spaces. Thus the oxygen supply to the tissues is greatly curtailed. This course of events is progressive unless interrupted. One means of interrupting this sequence is to ad-

minister sufficient fluid to restore adequate circulating volume and improve the rate of blood flow. Furthermore, it is imperative that the vicious circle of progressively diminishing blood volume and blood flow and tissue anoxia should be interrupted as early as possible before severe and irreversible damage to the tissues occurs.

Blood transfusion has been the most acceptable measure in shock therapy. In profound shock, however, urgency in the administration of fluid is vital. The delay involved in securing blood and in the necessary laboratory tests of typing for compatibility and the like diminishes the value of blood transfusion, for in this time interval the state of shock may become irreversible and fatal. Even when a bank blood is available there is an unavoidable delay in performing laboratory tests.

The authors state that in a previous publication they had demonstrated that serum is an effective agent in combating shock resulting from hemorrhage. They review the case histories of 47 patients suffering from a variety of conditions who received human serum transfusions. Those patients suffering with shock from hemorrhage and other causes, hypoproteinemia or burns, were definitely benefited by serum transfusions, and in a number of instances a dramatic recovery was observed. The authors discuss the preparation of serum and bring out that the supply of serum is limited only by the supply of blood and when it is prepared it can be preserved for a long time. Serum transfusions may be given without preliminary laboratory typing and compatibility tests. No reactions were observed or need be anticipated if serum is properly prepared. Serum is preferred to plasma because it does not contain sodium citrate and because fibrin precipitates do not occur. The authors stress the point that serum is a valuable adjunct to any hospital or military transfusion service.

PAUL MERRELL, M D

Clegg, J W, and Dible, J H. The Preparation and Use of Human Serum for Blood Transfusion in Shock. *Lancet*, 1940, 239 294

The use of stored blood is limited by its rather rapid deterioration and the number of unpleasant reactions that have occurred from it. To obviate these the separation of plasma from stored blood and its use as an alternative to whole blood have been advocated. This procedure effects a big economy in the blood bank. The resulting plasma-saline-citrate mixture has, however, disadvantages of its own. They are:

First, the fibrinogen fraction is unstable and tends to precipitate more and more on standing. In consequence the plasma solution comes to contain particulate matter, which makes the use of a straining filter essential. This prevents the plasma mixture from being given through a simple tube and funnel in an emergency when more complicated apparatus, which incorporates a filter in its system, is not available. Second, the separation of plasma from the cells involves a good deal of manipulation and, in addition, there is considerable chance of contamination.

The authors describe a method of preparing serum from stored blood with the advantages that the serum is sterile and of a satisfactorily high protein content, and can be given to patients irrespective of their blood-groups. The solution seems to remain free of particulate matter. The process utilizes blood which has been in the bank too long to be used for whole-blood transfusion, and thus effects a big economy.

In view of the widely held opinion that human serum is toxic when prepared by methods similar to the one used by these writers, skin tests were carried out on 9 batches of sera, a total of 54 tests being made. In none of these was there any reaction.

HERBERT F THURSTON, M D

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Peters, J. P. The Structure of the Blood in Relation to Surgical Problems. *A Surg* 940, 490.

The author notes that, as a general principle, it is reasonable to assume that reparative processes will be favored by measures that will preserve the integrity of both the volume and composition of the body fluids. All the secretions of the gastro-intestinal tract are approximately equal concentrations of chemical components. Fluids introduced into the stomach or intestine rapidly assume a composition which resembles, so far as salts are concerned, that of the native secretions of these viscera. When a liter enters the stomach or intestine enough salt is poured into it to make it isotonic with the blood serum, and the composition of the salt mixture assumes the electrolyte pattern characteristic of that portion of the alimentary canal in which it happens to be. If a liter of water or saltless fluid, introduced into the intestine, is lost by vomiting or through fistula, it will remove with it, approximately, the salt from one liter of serum or interstitial fluid. If vomiting is long continued, a final stage is reached in which dehydration, alkalosis, salt depletion, and reduction of osmotic pressure are all combined.

In severe diarrhea, bicarbonate is lost in the stools, while chloride is excreted in the urine. The end result is a deficiency of sodium and bicarbonate.

With a relative excess of chloride in the depleted body fluids. The concentrations of sodium bicarbonate and chloride in the serum give valuable information concerning the severity of vomiting and diarrhea and the extent of the consequent depletion of salt and water. There is reason to believe that body cells swell when the salt concentration in the body fluids falls, just as red blood cells swell in hypotonic salt solution. Such swelling must seriously impair functional integrity. The most obvious clinical effects of salt depletion and dehydration are shock and failure of renal function, the latter manifesting itself in elevation of the blood non-protein nitrogen.

After his review of the physiological facts relative to fluid regulation, the author notes certain inescapable implications.

The alimentary canal is not relieved of work by the introduction of fluid, especially water.

Efforts should be directed to the prevention of distention rather than to the decompression of the stomach or intestine.

5. If only physiological isotonic solution are introduced into the alimentary canal, dehydration and salt depletion will be minimized and the need for parenteral fluids will be proportionally diminished.

In conclusion, the author observes that distention and vomiting, either before or after operation, may often be allayed or checked by treating the gastro-intestinal tract as completely as possible. Complete rest is most easily achieved by withholding all food and fluids by mouth. If drainage by tube or if surgery is instituted because this course or the courage of the physician fails, care should be taken that as little fluid as possible is introduced and that all food or fluid given by mouth or through the tube contains enough salt to make it isotonic with the blood serum. This allays secretory and motor activity of the gastro-intestinal tract and mitigates dehydration and salt depletion. If the sum of bicarbonate plus chloride in the serum is reduced, saline should be administered parenterally to restore the fluid and salt content of the body. Glucose may be added to the intravenous saline solution to provide some nutrition and to reduce the protein metabolism. It is necessary however under these circumstances, to administer large amounts of fluid parenterally. Only enough is required to establish an adequate volume of urine. The patient who is excreting from 1,000 to 500 c.c.m. of urine daily is seldom a subject for anxiety. JESSE F. THURSTON, M.D.

Rawlin, I. S. Hypoproteïnemia and Its Relation to Surgical Problems. *Ann. Surg* 940, 544.

The important factor in persistent vomiting, in diarrhea, following extensive burns, and in many other conditions is the protein of the body available to meet the body's demands, or the part that an adequate concentration of the plasma protein plays in keeping fluid in the blood vessels. Patients with restriction of diet, a visceral injury or with an excessive plasma loss have a reduction not only in the concentration of plasma protein but also in the total available plasma protein. There is no such thing as a critical level of plasma protein at which edema becomes manifest. As soon as the plasma protein falls below the normal concentration, fluid begins to leave the vessels, which results first in latent and finally when the accumulation of fluid in the tissues is great enough, in an evident edema. The administration of large amounts of neutral sodium salts will intensify the edema normally occurring at the same level as the plasma protein. In the presence of hypoproteïnemia, attempts to restore normal fluid and electrolyte balance, without at the same time increasing the colloid osmotic pressure by adding to the plasma protein, too frequently tend to result in adding to the extravascular fluid reservoirs.

During undernutrition, these protein is protected as long as carbohydrate and fat are available for energy requirements. However tissue growth requires protein components, the amino-acids or larger aggregates, for building material.

As the plasma protein concentration falls from the normal 7.0 or 7.5 gm. per cent the osmotic pressure exerted by the plasma is reduced and fluids begin to leave the vessels and produce edema.

Hypoproteinemia intensifies the edema of trauma naturally occurring at the site of gastro intestinal suture. Under normal conditions of fluid exchange the edema of trauma begins to disappear from forty-eight to seventy-two hours after operation, but in the presence of hypoproteinemia it continues to increase during this period, and results in a mechanical impediment to the gastric contents, and a decrease in intestinal motility.

The most rapid means of correcting protein deficiency is by giving repeated plasma transfusions. It is better to administer a small amount of plasma repeatedly, over a long period, than to inject a large amount during a very short period.

Delayed wound healing and disruption is associated with a profound disturbance in protein metabolism, the hypoproteinemia being only an easily measurable indicator of the extent to which the so-called "labile stores" of protein have already suffered. Vitamin C deficiency is also an important factor in wound disruption and delayed healing.

A liver with a high lipid and a low protein content is maximally susceptible to injury, a liver with a low fat and a high protein content is maximally protected from injury. Carbohydrate is advantageous if during its deposition in the liver fat is displaced and if, as a result of an adequate source of hepatic glycogen, hepatic protein is spared.

HOWARD A. MCKNIGHT, M.D.

Feriz, H. Experiments with Tampons and Membranes Made of Collagen. *Surgery*, 1940, 8: 654.

The surgical importance of an absorbable and assimilable tampon material is evident. It would no longer be necessary to leave a foreign tissue in the body, which disturbs and delays the healing of the wound, in the form of an unabsorbable tampon. All the dangers associated with the removal of a tampon would be obviated, and the patient would be spared the pain associated with the manipulation of tampons. Moreover, the field of application of an absorbable, biologically non irritating material could be widely extended, as compared with that of the tampon now in use.

The present development of resistant fiber from dissolved collagen creates the possibility for experimental investigation on absorbable tampons. The characteristics of a new, assimilable material that might be useful in surgery, and for tamponade and the isolation of tissues and organs were studied, and the result described. The material, brocatamp, consists of collagen and appears to be perfectly non irritating to the surrounding tissues when implanted in rabbits. It is partly absorbed by the lytic activity of ferments and by phagocytosis, and partly organized either by direct infiltration of the connective-tissue cells or by the formation of granulation tissue.

SAMUEL KAHN, M.D.

Stchukarev, K. A. The Pathogenesis of Postoperative Pulmonary Complications. *Vestnik khir.*, 1940, 59: 443.

Pulmonary complications are as frequent after local as after general anesthesia, although it must be admitted that they are more serious if ether is used in laparotomies. The rôle of aspiration has apparently been overemphasized. Some authors were inclined to consider exposure as an important causative factor in the development of pulmonary complications but these complications have not decreased since the introduction of artificially heated operating tables. Exposure may be considered only a minor contributing factor. The frequency of pulmonary complications in children and adolescents with normal hearts speaks against the importance of hypostatic factors, particularly stasis of the blood caused by heart failure. Apparently older writers were confusing a real hypostatic condition with an obstructive atelectasis. Hypostatic conditions may be considered as minor factors contributing to the development of postoperative pulmonary complications. As to pulmonary embolism, its occurrence is rare and the condition has no relation to postoperative pneumonia. The concept of microembolism, advanced by Wharton, Parson, and others does not find any support in clinical observations because pulmonary complications appear earlier and are not accompanied by characteristic signs of an infarct, such as hemorrhagic sputum and pleural pains. Pulmonary embolism should be sharply differentiated from postoperative bronchitis or bronchopneumonia which form the bulk of pulmonary complications. The author is not inclined to share the opinion of clinicians who believe that a pre-existing infection is an important factor, because the frequency of such complications was found by him to be approximately equal in a group with and in another without postoperative pulmonary lesions.

The following factors must be considered as the most important in the pathogenesis of postoperative pulmonary complications: interference with the function of the diaphragm, hypoventilation of the lower portions of the lungs, constriction of the bronchi, disturbance of the tonus and motor function, impaired function of the ciliary epithelium, and the suppression of cough. Instead of speaking of obstruction of the bronchi and massive collapse of the lungs, the author prefers to speak of the draining function of the bronchi because a real obstruction does not occur in each instance. Retention and the multiplication of bacteria may take place without complete obstruction, as a result of suppressed cough and a disturbed function of the ciliary epithelium. It follows that atelectasis does not necessarily precede the development of pneumonia. Clinical and roentgenological examinations lend support to the author's concept of postoperative pulmonary lesions.

As to therapy, an active regimen, elevation of the head of the bed, limitation of circular dressings, frequent respiratory exercises, and inhalation of car-

bon dioxide are recommended. Morphine is indicated the first few days after the operation because it removes the inhibition of respiration caused by pain. The aspiration of bronchial mucus through bronchoscope in cases of threatening massive collapse of the lungs or pneumonia may be highly recommended. Quinine and camphorated oil are indicated in the treatment of postoperative pneumonia because they exert an inhibiting effect on pneumococci.

JOSEPH E. NAKAT, M.D.

Singus, J.: The Prevention and Roentgen Therapy of Thromboses. (Verhütung der Thrombosen und deren Röntgenbehandlung). *Chirurgen. Gymnast.* 939, 4-5.

After a discussion of the cause of thrombosis, in which the collaboration of circulatory disturbances with changes in the blood and in the blood vessel wall is mentioned particularly, the author refers to the importance of prophylaxis, which should be instituted before operation or childbirth. The heart and circulation are carefully examined, an elastic bandage is applied to any existing varices, and fall of blood pressure from spinal anesthesia or from vomiting in the course of operation is prevented so far as possible by circulatory measures. By means of flannel stockings cooling of the legs is made impossible. Immediately after the operation the legs of the patient are exercised passively by an attendant for five minutes, the bed is warmed with electric lights, and its foot elevated 5 cm. Both after operation and after delivery leg and breathing exercises are begun on the first day. In spite of these measures thrombosis occurs (in the author's material after 2.14 per cent of the operations and 0.76 per cent of the deliveries) the patients receive roentgen therapy. In 49 cases of thrombosis, 3 deep, 3 superficial, and 6 mixed, roentgen therapy was undertaken. Careful transportation to the roentgen apparatus is important. The extremity is divided into several fields and from 100 to 200 roentgens per field are given. In superficial processes one treatment is enough, in acute processes the treatment is begun with small doses. The duration of the process is shortened by roentgen treatment, the pain and swelling disappear more rapidly and the pulse and temperature soon return to normal.

(R. E. FEIKEL) RICHARD WARREN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Beilander, O.: The Treatment of Acute Frost Injuries. (Zur Behandlung akuter Frostschäden). *Strahlentherapie* 940, p. 457.

The time-honored treatment of acute frost injuries by massage with snow for the purpose of restoring circulation, is beginning to meet opposition. In the Handbook of the Swedish Red Cross, this treatment is considered to be of little value and simple massage is recommended instead. In the latest Field Service Manual of the Swedish Army

the snow treatment is supplemented by massage with wool and, at regular intervals, by occasional applications of warm water containing soap, with rubbing in the direction toward the heart.

The author's total rejection of the snow massage treatment is based on practical and theoretical objections. Cataplectic injuries frequently occur which are often more serious and dangerous than the original lesion. These dangers are not stressed sufficiently or at all in the popular presentations. Furthermore, the proponents of the method defend it on the basis of the necessity of thawing out the frozen part slowly. It appears irrational, however, to warm it by massage and, at the same time, to cool it with snow rather than to omit the latter entirely and to avoid too rapid heat production by carefully controlled massage. Polar explorers have, apparently entirely abandoned the snow treatment. A scientific participant in the expedition wintering on the Nordenskiöldfjeld on Spitzbergen told the author some four years ago that simple rubbing with the hands had served him well, and Admiral Byrd expressed himself to the same effect in his book "Alone at the South Pole." "The questionable method of rubbing with snow is not used in the Antarctic. At 50 degrees below zero, snow is as hard as stone; one might as well rub himself with sandpaper. A frozen foot of one of his companions was cured by placing it for from fifteen to twenty minutes against the skin of the abdomen of one of his comrades."

The author has not used snow for the past seven or eight years. In local freezings there are local changes in the cells in the form of colloid chemical disturbances plus spasms of the blood vessels, particularly of the arteries, from direct as well as indirect cold stimuli which lead to ischemia. The local changes, when severe, may cause gangrene, which also, of course, may result from the ischemia. In all milder cases, the vascular spasm dominates the picture. Because of the good results obtained by contrast baths in vascular spasms of other conditions, such as intermittent claudication, the author has used them in acute frost injuries. In the first case so treated, a young man with a frozen toe that had been rubbed for one and one-half hours with snow by his comrades without success until the skin was degenerated, response was so surprisingly good, that circulation was completely restored within five minutes. In most of the following cases, the result was even more rapid.

A moderate range of temperature was always used, the warm water being somewhat below body temperature the cold only about 5°C. Warmer water should be used for only very short periods. According to Moberg, in the treatment of chilblains, hot water should be applied for only ten seconds, because longer immersion relaxes the blood vessels. Otherwise hot and cold contrast baths are minute in each is sufficient, with perhaps slightly longer immersion in the hot bath than in the cold. The thawing should proceed slowly otherwise the

restoration of the normal cellular chemistry is jeopardized

The author recommends beginning with massage with the hands or dry wool and later thawing with cold water, the temperature of which is gradually increased to that of the room. He warns particularly against the use of hot water, since temperatures in the neighborhood of 50°C may produce irreversible changes in the blood and blood vessels (hemolysis has been seen with even 50° and 52°). He, therefore, does not recommend the 45°C water of the army regulations, and believes the contrast-bath temperatures should range between 15° and 35°C. The baths should be continued until the ischemia has entirely disappeared. The disadvantage of the method is that it requires warm water, and the question is what is easier and quicker, building a fire and warming water, or rubbing with snow? Resistant cases should be referred for surgical care as soon as possible. Amputation should be considered only when there is definite demarcation. Because of the reflex effects of the cold upon the sympathetic system, various operations on the vascular nerves may relieve the spasm and restore circulation. Among others up to now, x-ray treatments have been recommended for only chronic cases. The author believes they might also be used in recent cases, to initiate movement in the vessels, which is most important. (RICHTER) LEO M. ZIMMERMAN, M.D.

Girdlestone, G. R. Plaster-of-Paris. *Lancet*, 1940, 239 287

Many war wounds are best treated with plaster-of-Paris. The use of this medium has peculiar virtues and dangers, and calls for special craftsmanship. It is an attractive medium. When the plaster is in good order, a creamy bandage or fabric makes a rigid shell in a few minutes, and passes progressively from almost perfect pliability to rigidity at a rate which conforms favorably with the purposes for which it is used.

The two main methods of use of plaster of-Paris—the creamed fabric method and the bandage and water method—are described in detail.

SAMUEL KAHN, M.D.

Masciottra, E. The Endarterial Injection of Mercurochrome in Infections of the Hands (El mercurocromo endoarterial en las infecciones de la mano). *Rev méd-quirúrg de patol femenina*, 1940, 16 273

In certain cases the author has given endarterial injections of mercurochrome in the treatment of infections of the hands, following the method advocated by Leriche and Dos Santos.

The endarterial method was first used in 1914 by Goyanes, who employed it in the treatment of tuberculous arthritis. In the same year Leriche and Hedauss successfully used the endarterial injection of anti-tetanic serum in the carotid artery. However, the first to use the procedure as a systematic method was Reynaldo Dos Santos, who had observed that

there was no unfavorable reaction following arteriography. First he made simple injections of antiseptic drugs into the arteries in many infectious conditions and found they were beneficial. Later, at the suggestion of Joao Dos Santos, he also compressed the veins, by this means he could stop the immediate diffusion of the drug in the circulation and allow a longer period of contact with the tissues. The number of successful cases increased.

Leriche has employed this technique since 1929, and in 1938 he said that in his clinic of Strasbourg 2 or 3 endarterial injections were made every day. He has often seen the temperature fall to normal after only 1 injection of mercurochrome with definite arrest of the infection. After nine years of experience he continues to believe in the usefulness of this method and the value of studying it.

The indications for endarterial injection are manifold. They include all of the serious localized infections, with or without a tendency to spread in surface and depth. The injection has been employed especially in infections of the extremities of the limbs, superficial and deep phlegmons, tenosynovitis, cellulitis of the arm, and suppurative arthritis of the elbow. In serious infections, as for instance in 35 cases of arthritis with gangrene of the limbs, the previous injection of endarterial mercurochrome made possible a limited amputation. The gaseous gangrene was also favorably influenced by injecting anti-gangrenous serum into the arteries. It has also been employed in meningitis, encephalitis, and osteomyelitis of the maxilla. The location of the injection is indicated by the site of the infectious lesion. The point is to bring the drug in the most direct manner to the focus of the infection, according to the vascular anatomy of the region.

The location of the pressure cuff depends also on the part which has to be treated. For the head, the injection must be made in the carotid artery, in the axillary artery for the arm and elbow, and in the humeral artery for the forearm, wrist, and hand.

In the gynecological infections the injection goes into the abdominal aorta. As for the lower extremity, Dos Santos recommends the venous approach to reach the foot and the distal part of the leg and the femoral artery to treat the knee and the thigh.

The substances injected are several anti-gangrenous and anti-tetanic sera and drugs, such as gentian violet and mercurochrome, recently sulfanilamide has been used with excellent results. The venous approach requires less concentration of the solution because of the larger amount of the injection. The endarterial injection acts by allowing the active substance to come into close contact with the bacteria and also by producing a favorable reaction of the cells of the diseased tissues. The author has treated about 10 cases of acute infections of the hand, such as cellulitis and tenosynovitis. In each case the treatment consisted of an injection of 5 cc of mercurochrome in an aqueous solution of 1 per cent concentration. The injection was made in the humeral artery, and a pressure cuff was put

in the distal third of the arm, over the elbow. Immediately after the injection the patient felt a slight pain in the lesion, which disappeared almost at once and left only a sensation of prickling in the whole hand. At the same time the skin of the hand and forearm became stained light red, showing that the dye had reached the capillaries. As soon as the pressure was released, the color disappeared and there was an immediate diminution of the pain in the lesion. The injections were repeated 2 or 3 times on subsequent days and no disagreeable reaction was ever observed. The effect of the injection was always very marked: the pain, the swelling, and the redness disappeared and the skin on the lesion became lightly pigmented, dry and wrinkled. If the infection was of longer duration and there was abscess formation, this had to be drained according to the usual treatment of infections of the hand. However, the effect of the injection was always beneficial. It limited the spread of acute infection and the number of dressings required. The author believes that, if the injection is made in the early stages of an infection, it can often be terminated quickly. Some of the cases which are mentioned in the article show excellent results and give proof of the usefulness of this method.

Hector Manson, M.D.

Smith, E. J. R. The Use of Sulfur-Containing Compounds, Particularly Pentothal Sodium, in Conjunction with Sulfapyridine. *Brit. M. J.* 940, 455.

It has been said that sulfapyridine should not be given to a patient if he has recently received pentothal sodium for the induction of anesthesia and, conversely, that a patient under treatment with sulfapyridine must not be given pentothal sodium. This prohibition may be inconvenient in both directions because subsequent to an operation during which pentothal has been employed it may become advisable to start sulfapyridine therapy for some unexpected infective complication. On the other hand, a patient with large infected wound who is receiving sulfapyridine might all be given some pentothal for the first dressings or for the opening of abscesses. The reason for the prohibition has been the large amount of sulfur (1 per cent) present in pentothal sodium.

Thirty patients are given pentothal for anesthesia during operation. In 7 pentothal was administered for anesthesia at the time sulfapyridine was given intravenously. In patients sulfapyridine was given intravenously within 2, 4, or 6 hours after anesthesia. Eight patients received sulfapyridine by mouth at the time of operation; 9 patients received sulfapyridine by mouth (within 2, 4, or 6 hours after operation) and 4 patients received sulfapyridine by mouth within three days after operation. In all of these the only complication was nausea and vomiting. However, the incidence of this complication appeared to be lower in this series than in other series of patients given sulfapyridine alone. No cyanosis occurred in any case.

Magnesium sulfate and saline purgatives in general have been forbidden to patients receiving sulfapyridine or pentothal, as such a combination is said to cause cyanosis. If this is really true it is again unfortunate, because there are certain types of cases which require both drugs. The author refers particularly to those frequent cases of head injury in which there is both an actual or potential infection of the brain or scalp, and the evidence of state of high intracranial pressure due to edema and congestion of the brain. Perhaps less important but more serious are those cases of patients with high pressure due to cerebral tumor and other conditions, who develop an infection, for example, a pneumonia, after operation. These patients require sulfapyridine for their infection and also magnesium sulfate by various routes for cerebral dehydration. Both at the National Hospital for Nervous Diseases, London, and at Horton, the author has dehydrated such patients by oral and rectal administration of magnesium sulfate during sulfapyridine medication without noting any untoward effects.

From these observations it appears that patients receiving sulfapyridine can safely be given pentothal and magnesium sulfate at the same time.

M. W. E. Lichtenstein, M.D.

Campbell, W. C., and Smith, H.: Sulfanilamide and Internal Fixation in the Treatment of Compound Fractures. *J. Bone & Joint Surg.* 940, 959.

Fifty-two cases of compound fractures are reviewed by the authors in this study of the preventive or prophylactic action of sulfanilamide in compound fractures. They consider the study however only a preliminary report since a more comprehensive series of cases is now being accumulated. The fractures were divided into three groups: (1) fresh compound fractures, (2) old compound fractures with a previous infection, and (3) compound fractures with an active draining infection. Some form of metallic internal fixation was applied to thirty-one bones in 31 of the 52 patients.

Fresh compound fractures. A comparative analysis is made between the 25 cases in this group and larger control group. The percentage of infection, 8 per cent in both groups, did not vary but the evidence suggests that union occurs earlier in these infected cases that receive sulfanilamide (averaging two and seven-tenths months) than in the control cases (without the drug) (average of five months). This may mean that sulfanilamide is instrumental in arresting infection. According to their table however the incidence of malunion was higher in those cases treated with sulfanilamide (7 cases or 28 per cent) than in the control group (3 cases or 6 per cent). Three deaths and cases of osteomyelitis occurred in the control group none in the sulfanilamide-treated group.

Their routine for the administration of sulfanilamide is to place from 5 to 20 gm of the crystals in the compound wound at the time of operation, the

wound then being closed without drainage. Twenty-four hours postoperatively the drug is started by mouth, from 15 to 20 gr being given every four hours

A further division of this first group was made in order to more accurately compare the incidence of infection to the degree of soft-tissue injury. There were no infections in the 8 cases of wounds classified as *mild*. Two of another group of 8 cases, termed *moderate* because of fairly extensive skin lacerations, showed infection. The 19 classified as *severe* revealed, in addition to extensive skin lacerations, considerable maceration of the tissues and foreign material in the wounds. The 8 infections that occurred among these 19 cases were equally divided between the cases in which internal fixation was employed and those in which no internal fixation was used.

Old compound fractures with previous infection. These 7 cases were thought to be significant from a standpoint of latent or potential infection, and although rather extensive operative procedures were performed on this group, no infections occurred. Eight grams of sulfanilamide or ten grams of neoprontosil were administered every day, from twenty-four to forty-eight hours before operation, up to from three to seven days after operation.

Compound fractures with active infection. The active infection and draining sinuses associated with the fractures in this group were often accompanied by mild elevation of the temperature and had existed for from three to nine months prior to operation. The corrective procedures carried out on these cases could be considered formidable operations. Internal fixation was employed in 10 cases.

The authors believe that the results with this type of fracture, those with active infection, were the most striking of the entire group in which chemotherapy was used, for although draining sinuses persisted in a number of cases for periods varying from several weeks to months, the wounds all ultimately healed and union of the bones occurred.

Prophylaxis in clean and potentially infected surgical cases. It was believed that the finding of a reliable prophylactic agent against postoperative infections would be particularly valuable in such potentially infected cases as a former virulent osteomyelitis. Sulfanilamide was used as such a prophylactic pre-operative measure in 51 cases. There was an incidence of 16.7 per cent of infections in this group as compared with an incidence of 10 per cent in an analogous control group of 100 cases. A sufficient number of infections occurred in the sulfanilamide-treated cases to create doubt of the prophylactic benefit of the drug in this group, but because of the limited number of cases studied, definite conclusions do not yet appear warranted.

Illustrations showing the types of internal fixation employed in selected cases of this series, together with statistical studies and comparisons arranged in tabular form, accompany the text.

HOMER PHEASANT, M D

Carroll, G., Kappel, L., and Lewis, B. Sulfathiazole, *Clinical Investigations J Am M Ass*, 1940, 115: 1350.

A study of the absorption, dosage, toxicity, and effectiveness of sulfathiazole was made in 200 controlled patients. The drug was administered orally to adults, in 0.5 gm tablets, and in smaller portions to children and babies. The sodium salt was given intravenously, a 1 gm ampule being dissolved in 100 c.c. of sterile distilled water and injected slowly. The powder was used locally, it was sprinkled generously into infected wounds, or introduced by insufflation into cavities.

The peak of blood concentration occurs in about four hours after administration of the sulfathiazole and begins to decline after a period of six hours. For example, an adult patient suffering from a staphylococcal cortical abscess of the kidney was given 2 gm of sulfathiazole at 9 a.m., and blood concentrations were reported as follows: at 11 a.m., 2.1 mgm per 100 c.c.; at 1 p.m., 5.2 mgm; at 2 p.m., 5 mgm; and at 3 p.m., 4.2 mgm. This is of clinical importance, and indicates that the doses of the drug should be spaced from four to six hours apart throughout the twenty-four hours in cases of serious involvement. After a single oral dose of 4 gm of sulfathiazole, 1 gm is recovered from the feces and urine in the first twenty-four hours, 2.5 gm are recovered in forty-eight hours, and some traces are found as late as seven days after administration.

The usual prescribed dose for an adult is 2.05 gm tablets orally every six hours. In the more severe cases a larger amount may be given with impunity. As much as 14 gm daily have been given with no harmful effects, 1 woman was given intravenously 1 gm of the sodium salt dissolved in 200 c.c. of sterile distilled water, together with 6 gm which were administered orally, in twenty-four hours, a blood concentration of 17 mgm per 100 c.c. was obtained and there were no ill effects.

Superficial lesions require smaller amounts than deep seated lesions. The necessity of administering the drug in doses sufficiently large to bring about the therapeutic effect cannot be overemphasized. The medication, when tolerated, should be continued for a week or ten days after all clinical evidence of the disease has disappeared.

Children tolerate the drug well. Six grains (0.4 gm) daily were given in the milk formula to a twenty-day-old baby suffering from staphylococcal septicemia, he recovered. Children of from two to five years of age have received 2 gm daily. No ill effects have been noted in elderly patients or in those with poor kidney function. Caution should be used, however, in treating patients with known liver and kidney deficiency, since the drug is eliminated through these organs. Sulfathiazole is best tolerated with food in the stomach and has been given beneficially with diluted hydrochloric acid rather than with the alkalis so often given with sulfanilamide.

The toxicity of sulfathiazole is manifested variously by abdominal pain, nausea, vomiting, head

ache, anorexia, melancholia, weakness, cutaneous rash, diarrhea, undue excitability, and nervousness. A peculiar conjunctivitis has also been noted. A few patients have presented red blood cells, albumin and casts in the urine. Acetyl concretions have been noted in the bladder, ureters, and kidney pelvis of experimental animals but no instance of concretions or anuria was encountered in the authors' clinical series.

The drug was found to be effective against the staphylococcus, pneumococcus, gonococcus, streptococcus fecalis, erobacter aerogenes, and, to a less extent, the bacillus proteus and bacillus pyocyaneus. Surgical drainage must, of course be instituted when indicated.

From the observations of others and from the authors' clinical experience, it is apparent that the sprinkling of sulfathiazole powder into an infected wound or on a lesion is also of definite value. Among the lesions so treated were old Dugrey's infections and herpes.

SAMUEL H. KLEIN, M.D.

ANESTHESIA

Vladimirovsky A. V.: Local Anesthesia and the Treatment of War Injuries. *Vestnik khir.* 940, 59-79.

The author highly recommends local anesthesia not only in the treatment of minor injuries but also

in the therapy of fractures. Shock may then be prevented, and dismemberment of the wound, amputation, and other procedures are facilitated. However the therapeutic value of procaine block in the presence of shock is more limited and therefore should be combined with a blood transfusion both procedures counteract the depressive states of the nervous system and improve the hemodynamic conditions. Furthermore, a massive infiltration of the tissues with procaine prevents the rapid absorption of toxic products of decomposed tissues. Moreover, regression may be obtained in early stages of inflammatory processes, independent of etiological factors.

The author recommends the use of local anesthesia in the treatment of abdominal wounds as well as of wounds of the extremities. Such anesthesia, contrary to the opinion of many writers, can be easily obtained and is not time-consuming. It offers the advantages of combating shock and counteracting the spread of infection.

Injuries of the chest, especially an open pneumothorax, are also treated by the author by local anesthesia, although in deep wounds the anesthetic effect may not be perfect if sufficient attention is not paid by the anesthetist to the intercostal nerves. If the shock does not rapidly subside in grave chest injuries, the local anesthesia is supplemented by cervical vagosympathetic block on the affected side.

JOSEPH K. VASA, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Lofstrom, J E, and Noer, R J The Rôle of Intestinal Intubation in the Diagnosis and Localization of Intestinal Obstruction *Radiology*, 1940, 35 546

Gastroduodenal siphonage by the utilization of the Miller-Abbott balloon-tipped tube has opened new avenues of approach to the diagnosis and treatment of intestinal obstruction. Such a tube can be introduced into the distended bowel and decompression be effected as the tube progresses along the gut to the point of obstruction. The balloon near the tip of the tube facilitates its passage.

In the study of intestinal obstruction, frequent roentgenoscopic and roentgenographic observations must be made to follow the progress of the tube through the bowel and to determine the resulting degree of decompression. When it is found that the tube has ceased to progress and that gaseous and fluid accumulations have been removed, localization studies are made by injection of opaque medium to the site of obstruction. If complete obstruction is present the medium can be readily withdrawn. This method permits the accurate determination of the exact type and extent of the obstruction. It is well to remember that the intubated bowel is less active than normal and that it may require several hours for the medium to pass only a few feet in the ileum.

When no evidence of obstruction or pathology is detected, the tube may be clamped and serial studies

may be carried out by means of the oral administration of barium. The tube may be used to advantage in any segment from the duodenum to the terminal ileum.

A number of cases are reported in which the accurate diagnosis of the site and etiology of the obstruction was made pre-operatively. In one instance a carcinoma of the duodenum was found, in another, gall-stone obstruction, in others, chronic ileitis and obstruction due to postoperative adhesions.

Figure 1 reveals an area of narrowing in the terminal ileum found in a case of early postoperative obstruction presumably due to adhesions. Decompression by intubation completely relieved the symptoms and no further surgical intervention was necessary.

HAROLD C OCHSNER, M D

Golden, R, Leigh, O C, and Swenson, P C
Roentgen-Ray Examination with the Miller-Abbott Tube *Radiology*, 1940, 35 521

After a brief consideration of deflation of the gastro intestinal tract, with special reference to the Miller-Abbott tube, the authors state that the purpose of this communication is to discuss the part played by the roentgen methods of examination in this procedure. Fluoroscopic control may aid in the passing of the tube into the duodenum. After the tube has entered the duodenum and the process of deflation has begun, the roentgen-ray examination becomes of prime importance to determine the program of the tube and the efficacy of deflation,

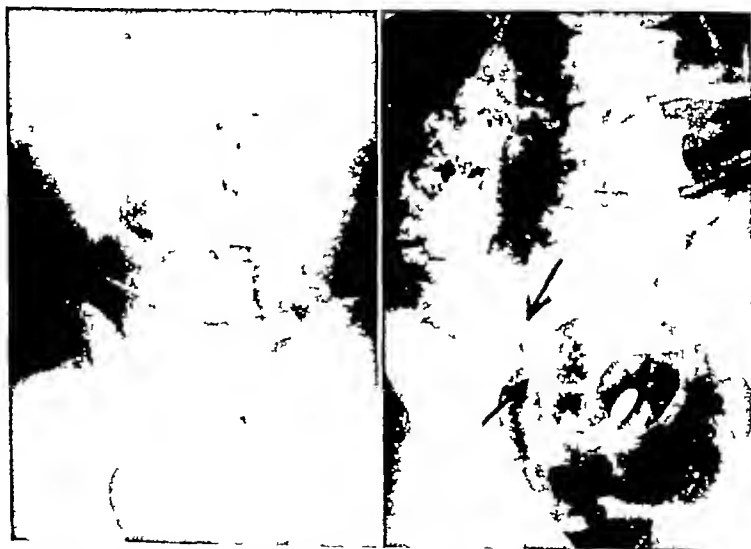


Fig 1 Early postoperative obstruction, presumably due to adhesions. a, left, reveals distention, b, right, reveals the area of narrowing in the terminal ileum.



Fig. Mechanical ileus due to late postoperative adhesions. After deflation and retreat of tube, barium injection disclosed short kink. (Without the aid of pressure apparatus. The mucosal folds in the kink are normal.)

and to record the findings if barium-sulfat suspension is injected through the tube.

The details of technique and findings of various types of lesions are described and illustrated and several case reports are included to call attention to the value of the information which may be obtained. Consideration is given to the conclusions which may be drawn from the progress of the tube. As deflation progresses in paralytic ileus the tube advances slowly much more slowly than in mechanical ileus. If there be questionable obstruction, the injection of barium will usually clear the doubt. The progress of deflation is indicated by diminution in the width of the distended loops and by diminution in the number of gas distended loops. Deflation of the small intestine does not remove gas from the large intestine. If the tube tip passes the cecum, mechanical obstruction of the small intestine is ruled out showing that the ileus is paralytic in type.

Injection of barium-sulfat suspension through the tube may give information not obtainable otherwise. In the author's experience no deleterious effect has ever been observed following its use in diseases of the small intestine. Usually only small amount of suspension is necessary to give the desired information. Injections should be made on the fluoroscopic table, preferably with rapid switch-over spot film device to record the observations. With it the exact location of the tube-tip whether in the small or large intestine, may be determined and constrictions may be localized. Frequently conclusions can be drawn relative to the nature of the lesion by noting the variation of the mucosal pattern. When adhesion causes the obstruction it usually produces narrow kink measuring from 1 to 3 cm. in length, in which the mucosal folds appear normal. Strangulation, by producing congestion and edema

of the wall, causes flattening, widening, or even obliteration of the mucosal folds. Inflammation involving the wall of the intestine from an adjacent focus or other focus causes partial obliteration or coarsening of the mucosal folds in the narrowed area. Chronic sclerosing enteritis (regional ileitis) may cause mechanical ileus and produce narrowing of shorter or longer segments of intestine. Malignant neoplasm invades and destroys the mucosa, mesentery, and hence distorts or obliterates the mucosal folds. An annular growth is usually relatively short, from 3 to 6 cm. Although the mucous membrane has been destroyed, the inner surface may be irregular. Intussusception produces long, narrow barium shadow. When the opaque material gets beyond the narrowing, it outlines the sheath into which the narrowed portion has invaginated, and the appearance will be the same as in intussusception.

ANATOMY HARTMAN, M.D.

Kirklin, B. R., and Weber, H. M.: Roentgenological Diagnosis of Diseases of the Small Intestine. *Am. J. Digest Dis.*, 1940, 7, 475.

The standardized technique of examination for diseases of the small intestine which is used at the Mayo Clinic is as follows:

The patient appears for examination in the morning after fasting over night. If there is no roentgenoscopic evidence of obstruction he is given 8 oz. of suspension of equal parts by volume of barium-sulfat and water. The usual inspection is made of the stomach and duodenum and the examiner attempts to force as much as possible of the suspension through the pylorus. The patient is then examined 10 to 15 minute intervals until the stomach is practically empty. At this period he is instructed to eat breakfast of the kind to which he is accustomed in order to stimulate forward movement of the suspension. Study of the lower loops of the ileum is best effected by the retrograde method.

Disease of the small bowel is manifested by deformity of the lumen, alteration of its caliber, staking of affected segments, signs of obstruction, and changes in internal relief. The mucosal pattern may be effaced or deformed.

Diverticula are of common occurrence in the duodenum, especially in the region of the ampulla of Vater. Diverticula of the jejunum, which are uncommon, are likely to be large and multiple. Meckel's diverticula are relatively common but definite roentgenological diagnosis is rarely established.

The principal roentgenological manifestations of new growths are localized deformity of the lumen, palpable tumor corresponding to the deformity, obliteration of mucosal markings at the site of the neoplasm, and signs of obstruction. Benign neoplasms are exceedingly rare, often single, and less multiple than malignant. They are usually small, pedunculated, and not obstructive.

Although primary carcinoma is extremely rare in the duodenum, this condition is less unusual in other parts of the small bowel. Scirrhous carcinoma usually

encircles the bowel. Ulceration is only superficial, the shadow defect is smooth and concentric, a corresponding mass is evident, and obstruction is noted. Soft mucoid carcinoma is the most common malignant neoplasm of the small bowel. It is usually associated with ulceration and frequently only a crateriform or deeply pitted base is present. This remnant of the tumor may not be palpable and signs of obstruction are usually absent. If a considerable portion of the tumor remains, the diagnosis will be fairly obvious, but if the carcinoma has been destroyed to its base, difficulty may be experienced in making a differential diagnosis from tuberculous or non specific enteritis. The most important point in the differential diagnosis is the fact that carcinoma is frequently limited to a short segment of bowel whereas enteritis usually affects relatively long segments. Sarcomas constitute a substantial percentage of malignant new growths of the bowel. The authors have found leiomyosarcoma to be the most common type, their roentgenological appearance is similar to that of simple intramural myoma.

The differential diagnosis of tuberculous enteritis and enteritis of indeterminate origin is usually difficult and often impossible. Both diseases present somewhat similar pathological changes and either may be restricted to the small bowel. In typical instances of tuberculous enteritis the lumen is roughly and irregularly corrugated. In chronic non-tuberculous enteritis the contour of the lumen is smooth and the narrowing is uniform. The final diagnosis, however, depends upon the demonstration of tuberculous foci elsewhere.

In certain nutritional deficiency states, alterations in the roentgenological appearance of the small bowel may be observed. These changes are so nearly alike that reliable differential criteria have not yet been established. The progress of barium through the bowel is delayed, peristalsis is sluggish, the intestinal contents divide the sub-divide irregularly, and the mucosal relief may be subdued or exaggerated. Eccentric distribution of the barium is striking and there may be dense accumulations in some of the intestinal loops and diffuse dispersion in other segments of the bowel. The intensity of all these signs is in direct ratio to the intensity of the clinical findings.

Involvement of the small bowel by diseases of adjacent structures is relatively common and it is often difficult to distinguish extrinsic from intrinsic lesions.

HAROLD C. OCHSNER, M.D.

Case, J. T. Roentgenology of Pancreatic Disease. Caldwell Lecture, 1939. *Am J Roentgenol*, 1940, 44: 485.

In this article the author summarizes much of our present knowledge of pancreatic disease with special reference to the diagnostic and therapeutic possibilities which roentgen rays offer in connection with it. He believes that clinical methods are far from adequate to point out the correct diagnosis in many instances and that the aid to be derived from careful

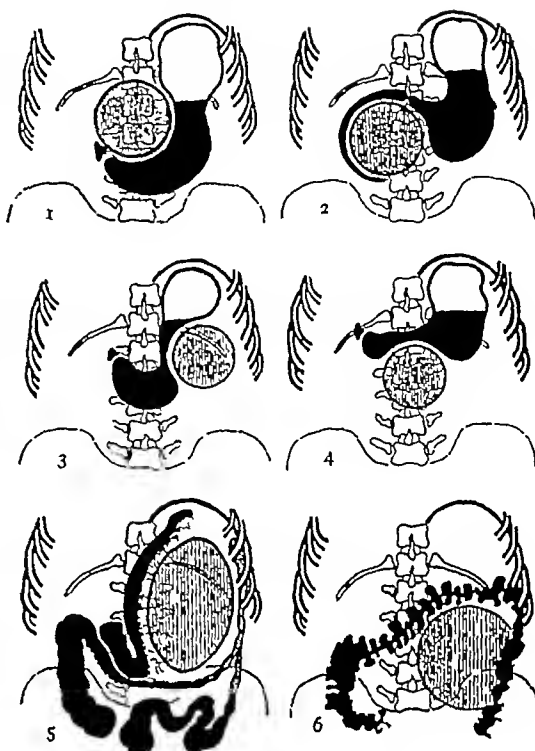


Fig. 1. Drawings from Porta and Roversi illustrating various roentgenological aspects of pancreatic cyst. 1, gastrophilic type, 2, cyst of head of pancreas, 3, cyst of tail of pancreas, 4, cyst of body of pancreas, 5, gastrophilic type, 6, mesocolic type.

roentgen study deserves general interest. In order to show in what way the roentgenological method may contribute in arousing, confirming, or denying the suspicion of pancreatic lesions the symptoms associated with various lesions are discussed and the findings which may be anticipated are described and illustrated.

Direct roentgenological depiction of the pancreas is not possible except with the aid of artificial pneumoperitoneum, and this method seems justified only in exceptional cases. Practically the only pancreatic lesions amenable to direct and positive roentgenological demonstration are pancreatic lithiasis and gas abscess. Nearly always indirect findings associated with findings obtained from the adjacent parts of the alimentary canal serve for diagnostic information. Anatomical considerations are discussed insofar as they may be of value as a basis for roentgen study and interpretation.

The various lesions which are given detailed consideration include pancreatic cysts, gas abscess, carcinoma, lithiasis, and acute and chronic pancreatitis. Cysts usually owe their recognition to the displacement, pressure, and filling defects they cause on



Fig. 2

Fig. 2. Carcinoma of head of pancreas. Duodenal spread. Irregular contour of duodenal shadow.



Fig. 3

Fig. 3 and 4. Calculi in both head and tail of pancreas.



Fig. 4

the barium-filled stomach, duodenum, or colon. Such defects are usually smooth in outline and vary with the location of the part of the pancreas involved. Excellent concepts of what may be expected are illustrated by drawings, sketches, and roentgenograms. Attention is called to possible sources of error and means of differential diagnosis.

Gas bubbles prevent accumulation of gas in the midepigastric region above a fluid level, demonstrable in the erect position or with the patient lying on the side. Examinations with an opaque meal serve to distinguish them from gastro-intestinal contents or diverticula which they may resemble.

Solid tumors of the pancreas may show compressions and obstructions in the neighboring organs or displace them if sufficiently large. If small there may be few or no roentgen signs associated with them, or functional disturbances of a non-specific character in the duodenum only may be present. In some cases extragastric tumor formation may be demonstrated by palpation during the fluoroscopic examination. When pressure on the barium-filled stomach causes filling defects to appear. The mucosal pattern in such instances is not disturbed and peristalsis is not interfered with, which factors tend to differentiate the lesion from an intragastric one. Carcinomas may invade the stomach or duodenum in which case they may cause irregularities of contour, alteration of the mucosal pattern, and functional disturbances of the stomach or duodenum which may make it difficult or impossible to determine the exact origin of the lesion. When the tumor is in the head of the pancreas it may produce widening of the duodenal normal curve. Compression or invasion of the duodenum may cause obstruction with appearances typical of that condition. Various special techniques are described which offer much help in arriving at accurate diagnosis in some cases, and the value of lateral films is stressed.

Pancreatic calculi appear in the roentgenograms as solitary or multiple round or irregular dense shadows lying near the upper lumbar vertebrae. When multiple their location usually suggests their origin, but frequently special procedures and diagnostic skill are required to differentiate them from densities of other origin.

In connection with acute pancreatitis, numerous authors are cited as having noted, either on plain films or in examinations made with a few s. shadows of contrast material, findings which they considered of definite diagnostic value when the condition was suspected. These are discussed and attention is called to the fact that such examinations may reveal associated pathology, which may have an etiological relationship. Chronic pancreatitis also offers possibilities for diagnostic aid from the roentgen examination especially if the lesion has progressed to the extent of causing firm enlargements of the organ. A possible connection between duodenal diverticula or dilatation of the ampulla of Vater and chronic pancreatitis has been suggested and these lesions are readily demonstrable roentgenologically.

Possible pancreatic lesions in connection with ulcers of the duodenum or stomach penetrating into that organ are discussed briefly and criteria for establishing this probability are mentioned. Diagnostic information relative to disease of the pancreas to be derived from cholangiography and cholecystography are also given consideration.

As regards radiation therapy of pancreatic disease, the results to date have not been very satisfactory. Chronic pancreatitis has responded fairly well to the author's experience but the results in neoplastic lesions have been only palliative. Reports from others are also cited to show that irradiation may prolong the life and alleviate the symptoms of patients with carcinomas of the pancreas, but it offers little hope of cure.

Asaou HARRIS, M.D.

Rendich, R. A., and Harrington, L. A. Roentgen Findings in Caisson Disease of Bone, with Case Reports *Radiology*, 1940, 35 439

Kahlstrom, Burton, and Phemister reported in the February, 1939, issue of *SURGERY, GYNECOLOGY AND OBSTETRICS* 4 cases of caisson disease of bone, to which they added 12 cases collected from the literature. They also described in detail the pathology of the disease, especially in the case in which autopsy was performed.

The authors now communicate 4 new cases in order to emphasize the rarity of this condition and its characteristic roentgen features. The primary lesion is an accumulation of nitrogen gas in the bone due to the too rapid removal of the individual from the decompression chamber. The roentgen changes produced resemble those seen after long interruption of the blood supply, as in slipped epiphysis, fracture, or dislocation. They may be placed in three categories: (1) aseptic necrosis involving the bones of the hips, shoulders, or knees, (2) medullary calcification in the diaphyseal ends of the long bones, and (3) hypertrophic arthritis. Numerous roentgenograms are reproduced to illustrate these changes. It is stated that the necrosis in the head of the long bones and the resultant osteoarthritis may constitute the only manifestation of the disease in the individual cases.

T. LEUCOTIA, M.D.

Forestier, J., and Robert, P. X-Ray Diagnosis in Chronic Arthritis. *Proc. Roy. Soc. Med.*, Lond., 1940, 33 707

The authors classify the roentgenological findings of inflammatory arthritis into three periods of development, namely, the periods of onset, of development, and of stabilization and repair. At the onset of the disease the roentgenographic findings may be negative for a period of several weeks or two or three months. The essential sign is bony decalcification which appears locally and is especially marked at the epiphyses of the affected joints. During the development of the disease the decalcification increases and sometimes both epiphyses are uniformly decalcified. The joint space may disappear not only as a result of narrowing of the space but because of increased density due to inflammatory deposits in the joint space, with loss of transparency. Postural changes are frequently detected in the period of stabilization and, if the damage has been extensive, final deformity will remain. Partial irregular recalcification takes place, the contours of the epiphyseal bone will appear more clear but there will be no reconstruction of the joint space or recovery of movement lost through fibrous or bony ankylosis.

The radiologic findings of arthrosis or osteoarthritis are also outlined in some detail. The first change in this condition is local hypercalcification, which appears in the suprachondral area of the epiphysis, especially at points of weight-bearing. It tends gradually to develop over the whole surface and also toward the center of the epiphysis. Usually this change appears in both bones forming the joint.

Hypercalcification is associated with progressive loss of trabeculation, which brings about softening of the bone substance. Later there are plastic changes in the contours of the epiphysis, flattening of the bony ends, and marginal lipping. Less commonly, local decalcification may occur in the course of arthrosis. This is true especially in the hip joint. In osteoarthritis the trabeculae disappear from the cortex and are replaced by the uniform dense shadow of opaque bone. At a distance from the joint space the trabeculae of the bone become thicker and rougher. The osteosclerotic bone can undergo plastic changes in its contour. Osteophytes and syndesmophytes may appear at the articular margins. The gradual thinning of the joint space in arthrosis is one of the essential characteristics of the disease. Postural changes may occur through pressure defects in the articular surfaces, which become softer.

HAROLD C. OCHSNER, M.D.

Van Nuys, R. G. Normal Bone Angles and the Roentgen Report. *Radiology*, 1940, 49 206

The author believes that the roentgenologist in reporting fractures can make his reports more definite and helpful by stating variations from the normal in angles and centimeters. He has studied numerous films of wrists, elbows, shoulders, hips, knees, ankles, and feet, and has recorded the measurements of angles in normal and pathological cases. He points out some of the important variations. Two rulers which he has found useful in obtaining the desired angles are illustrated. The indication of the amount of deviation from the normal in the manner outlined can materially assist the surgeon in the reduction of fractures and inform him if such reductions have been accomplished satisfactorily.

ADOLPH HARTUNG, M.D.

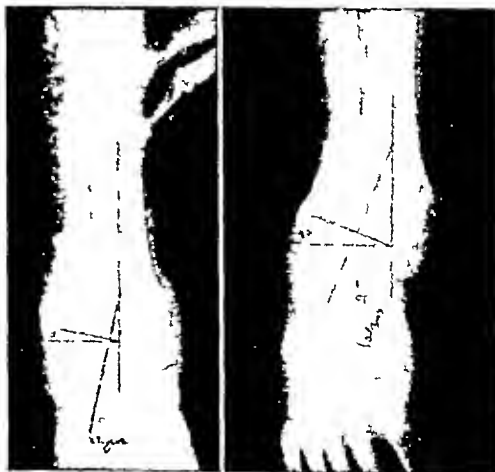


Fig. 1. On the right is an old Pott's fracture before attempted reduction, with 20-degree valgus. On the left is the reduction, with 12-degree valgus.

Heinrich, A., and Staedter G. The Changes in the Human Spine during Life as Revealed by the Roentgen Rays (Die Aenderungen im Raumbild der menschlichen Wirbelsäule während des Lebens). *Zeitschrift für Orthopädie*, 1929, 34.

The normal changes of the spine due to age as shown by anteroposterior and lateral roentgenograms are studied in detail. Schematic sketches are used to show how in the lateral view the long oval, ventral, and dorsally depressed form is gradually converted into right-angled form, in which during middle life slight upper and a lower depression occurs. Between the third and sixth years the connection between the body of the vertebra and this curve becomes visible in old age osteoporosis usually set in and a decrease in height of one or a group of vertebrae occurs, especially of those in the thoracic portion of the spine, and in particular of those in the anterior portion (edge-shape). More rarely a gradually increasing depression occurs in the upper and lower contour and it occurs pathologically in Cushing's disease and in multiple myeloma so that confusion with these diseases is possible. Also Hand-Schüller-Christian disease, osteomalacia, vitaminosis, and starvation osteopathy give similar pictures. According to Spiller spondylitic changes are seen in myeloma but not in the atrophy of old age. From the eleventh to the thirteenth year one often sees a three-cornered center of ossification of the cartilaginous marginal edge in the upper and lower corner of the ventral contour; this marginal edge usually melts or fuses with the body of the vertebra not later than the twenty-fourth year of life. In the dorsal spine of youth one frequently sees in the middle, running through the vertebra horizontally an apparent crack (Hahn's canal) through which veins course. The dorsal part of this canal is not visible after the second year of life, but the ventral part, especially in the fifth and seventh dorsal and in the first and second lumbar vertebrae frequently remains visible until the fourteenth year.

The relationship between the intervertebral space and the height of the vertebrae in the newborn is 1:2, after year I it is only 1:3 in the lumbar region and 1:3 in the region of the dorsal spine; at the age of eight the relationship is 1:3 in middle life 1:4 and in advanced age 1:3 or 1:6 in the dorsal region. The decrease in height of the intervertebral discs takes place particularly in the anterior portion because as a result of the normal kyphosis there is greater pressure here and because posteriorly the apical joints prevent a crowding together. A decrease in water content (which occurs analogously in the lens and in cartilage as age increases) of the intervertebral discs probably is responsible for their decrease in thickness. In the osteoporosis of the spine due to age associated with fish-spine formation, according to Jungbluth, the water content of the intervertebral discs is considerably increased so that this change cannot be considered as a simple change due to old age. According to the opinion of the author this is premature aging of the bodies of the

vertebrae whereas the intervertebral discs have the age of the remainder of the body and take on water only secondarily. In the roentgenograms of the newborn taken in the sagittal plane the bodies of the vertebrae show only two transverse shadows, the upper of which is much more concave upward than the lower one in the lumbar vertebrae one can recognize the membrana tectoria as faint shadow with the concavity down and. From the second year this upper shadow is also recognizable in the dorsal vertebrae, and whereas the membrana tectoria becomes only slightly flattened with age, the basilar membrane becomes horizontal in old age and even becomes concave downward. The upper edge of the vertebral arch is concave upward; this concavity becomes greater with age, the most prominent point often being covered with the spinous process. The attachments of the arch to the body of the vertebrae in the infant are at the upper lateral part of the vertebral body shadow and gradually move down and with age till they are at the middle of the vertebral body. The transverse processes in the dorsal part are visible in the newborn, but the processes of the lumbar spine produce recognizable shadow only from the second year. The spinous processes of the lumbar spine are visible in the picture from the third or fourth year of life, in the dorsal spine from the fifth to seventh years of life. After the eighth year of life all the spinous processes become visible in the sagittal view.

Among the pathological changes of the spine dependent upon old age the authors consider only those diseases which occur during a definite period of life. They discuss juvenile kyphoses, cranked age kyphosis, and spondylitis deformans. The juvenile or adolescent kyphosis (Scheuermann's disease) occurs, according to Schmorl, because the intervertebral disc develops gaps or lacunae in its hyaline marginal plate, which may be congenital or may develop because of some trauma, and which may protrude into the body of the vertebra. This disc prolapse causes the formation of a reactive cartilaginous or bony plate which is visible in the roentgenogram. In the lateral view these cartilaginous nodules may appear as partly rounded and partly irregular defect, especially in the anterior part of the lower edge of the body of the vertebra. During the florid stage and during the healed stage which occurs after one or two years, one frequently sees a definite wedge-shaped shadow in the dorsal spine and especially in the neutral portion of the body of the vertebra. Whereas the apex of juvenile kyphosis lies in the lower dorsal spine that due to kyphosis of old age and osteoporosis lies a little higher. The senile kyphosis is pathological if there is bony union ventrally between the bodies of the vertebrae as a result of the disappearance of the intervertebral discs. One must differentiate the kyphoses which are not due to old age and those in which as a result of pathological osteoporosis a fracture takes place. In regard to spondylitis deformans which according to Jungbluth begins early in the

third year of life in 20 per cent of people, the authors call attention to the fact that spondylitic spurs do not arise from the edge of the developed body of the vertebra but always a little above the previous marginal ridge. The rapidity of growth of these spurs is variable. "Spangenburg" always reveals a cranial and a caudal spur in advance, but the rate of growth of a single spur is very irregular. Illustrations show a "spangenburg" in process from one and one half to five years.

(ARTHUR HUNTZ) LEO A. JUNKER, M.D.

Haller, E. P., and Melnick, P. J. Pre-Operative Irradiation in Carcinoma of the Breast, A Histological Study. *Radiology*, 1940, 35: 430.

Our knowledge of the histological mechanisms by which radiation destroys tumors is at present incomplete. Melnick and Bachem in 1937 studied the time factor in the irradiation of malignant tumors and elaborated certain principles of radiation effect on experimental rat tumors when protracted and fractional methods were used. The authors now extend these investigations to the human being.

A series of 21 cases of cancer of the breast which were irradiated with tumor doses ranging from 1,200 to 4,500 roentgens over periods varying from eleven to forty nine days were subjected to mastectomy and the specimens examined histologically for radiation reaction criteria. The interval between the completion of the irradiation and the operation was from one to forty five days. In those cases which received the larger doses, the irradiation was carried to a full second degree skin reaction with erythema, vesiculation, and desquamation. The surgery was performed as soon as cleanliness was feasible.

The histological findings in these cases correlate closely with those found following the irradiation of rat tumors. In the early stages, radiosensitive tumor cells undergo primary necrosis. Beginning about three weeks after more extensive irradiation, fully developed pleomorphism of the remaining tumor cells can be seen, which eventually leads to abnormal mutation like forms (giant cells). Four or five weeks after the end of irradiation only small clumps of debris, containing groups of calcified giant-cell nuclei, are found, some of these being phagocytosed by foreign body giant cells. The normal tissues, including lymph and blood vessels, are intact and no fibrosis is observed. The startling thing, however, is the fact that at this stage the surviving carcinoma cells resume their activity with great vigor. Newly proliferating carcinoma simplex makes its appearance with progressive invasion along the lymph channels.

Therefore, since obliteration of the lymph and blood vessels does not occur and since 90 per cent of the irradiated breast cancers resume their growth early, the authors recommend that amputation be performed within from two to four weeks (instead of the usually recommended two to three months) after the end of irradiation to a full second-degree desquamative skin reaction. T. LEUCUTIA, M.D.

Garland, L. H. The Effect of Iodized Oil on the Meninges of the Spinal Cord and Brain. *Radiology*, 1940, 35: 467.

From his own observations and a review of the pertinent literature, Garland believes very definitely that fresh lipiodol may be used with complete safety as a contrast medium in the spinal subarachnoid spaces. He believes that no other contrast medium is at the same time as accurate and as harmless. He makes the point that it should be used only when the additional procedure of roentgenography is justified, and that its use should always have been preceded by thorough clinical, laboratory, and roentgenological study. He, like many another, has found encapsulated globules of the oil in the meninges months and years after its introduction into the cisterna magna or lumbar sac, but he has never seen changes in the underlying nervous tissue attributable to the presence of the lipiodol. He points out that one main objection to its use, other than the occasional mild pain and fever which may follow temporarily in some patients, is that it remains a permanent roentgenological defect, and that its effect on the patient, his physician, compensation boards, and juries may be one to cause apprehension, however unjustified. JOHN MARTIN, M.D.

RADIUM

Mueller, R. Five Years' Experience with the Radium Treatment of Hemangioma. Results and Appraisal (Fünf Jahre Radiumbehandlung von Hämangiomen. Ergebnisse und Kritik). *Wiener med. Wchschr.*, 1940, 1: 538.

The article analyzes the experiences with 144 patients, 115 of whom were females and 29 males. The latest treatment was begun at the end of 1938 so that a long enough interval for careful observation was afforded.

The hemangiomas were treated with radium, which in most cases was applied in direct contact or at distances not exceeding $\frac{1}{2}$ cm. In general, small amounts (20 mgm. of radium element) were used. The tubes which were applied with adhesive tape remained in place from three to four hours, the others from four to six hours. Between treatments intervals of from six to eight weeks and often from one fourth to one half year elapsed so that the average duration of treatment was nine and one tenth months. In this manner it was possible to avoid, even in infants, the radiation damage which occurs in the period when growth and development are most rapid. After one treatment the hemangiomas could be observed to cease growing and gradually to regress. They disappeared without leaving behind disfiguring scars or other skin changes.

Radium treatment is indicated not only in the inoperable hemangiomas, it is the treatment of choice in the operable ones also because, on the one hand, it avoids mutilation and the danger of infection and, on the other, it leads to the best cosmetic result. The earliest treatment possible is important.

to the cosmetic result. Numerous children were treated at the age of four weeks. Radium needles were used in occasional cases when an especially circumscribed and effective result was to be obtained. In dults, whose blood capillaries are very much less sensitive to radiation, and in cases in which the application tends to be technically difficult. More recently and particularly in the oral cavity close radiation with the Van der Plaatz plate has been performed, this will be reported later. Because of its safety and its brilliant results radiation treatment of hemangiomas is the treatment of choice. (Dietrich Blas) **EDWARD WALKER, M.D.**

Melville, A. G. G. The Double Radium-Mold Treatment of Carcinoma of the Floor of the Mouth and Lower Alveolar. *Brit. J. Radiol.* 1940, 3: 337

The double mold radium method which is practiced at the Christie Hospital and the Holt Radium Institute of Manchester is believed to be ideal for the treatment of carcinoma of the anterior part of the floor of the mouth and alveolar. It consists essentially in sandwiching the tumor between a layer of radium in the mouth and a second parallel layer under the chin. Occasionally a radon implant is added to the area of weaker dosage to make up the difference.

The intra-oral mold is made of such thickness as to permit a distance of 5 mm. between the radium and mucous membrane. The submental mold which is carried on a plexiglass collar allows a distance of 2 cm. or more between the outer radium and the skin. Once the molds are placed in position, roentgenograms are taken to check whether they are parallel and whether they include the whole tumor in the field of irradiation or not. The strength and arrangement of the tubes are such that a dose of 9,000 roentgens is delivered at the mucous membrane, 6,000 roentgens on the skin, and a minimum of 5,000 roentgens to the irradiated tissue. This means that, on an average, the molds are applied for ten hours a day for ten days.

It has been found that lesions exceeding 3 cm. in diameter rarely find themselves to permanent cure; therefore this diameter may be accepted as the maximum for a treatable tumor. The thickness of the floor of the mouth, that is, the distance from the surface of the intra-oral mucosa to the surface of the submental skin varies between 3 and 4 cm. If 3.5 cm. is taken as an average, the following table gives the milligram hours necessary with 0.5 mm. of platinum filtration to obtain the aforesaid dosage in roentgens:

Inner Mold 10 cm. ² @ 0.5 cm.	760
Outer Mold 8.8 cm. ² (oval 6x4 cm.) @ 1.0 cm.	650
Inner Mold 5 cm. ² @ 0.5 cm.	2090
Outer Mold 24.7 cm. ² (oval 7.4x5 cm.) @ 2.0 cm.	694
Inner Mold 10 cm. ² @ 5 cm.	2730
Outer Mold 31.4 cm. ² (oval 8x5 cm.) @ 2.0 cm.	7600

Inner M 5 cm. @ 0.5 cm. 370
Outer Mold 37.6 cm. (oval 8x6 cm.) @ 2.0 cm. 1760

For radium filtered by 1 mm. of platinum, multiply these figures by 1.5

For radium filtered by 1.5 mm. of platinum, multiply these figures by 22.

A total of 96 cases as treated by the double-mold method from 1933 to 1938, inclusive. A statistical compilation of the final results shows that 60 per cent of the treated patients were alive and free from disease three years after treatment, and that 61 per cent of the primary lesions healed and remained healed for three years, although the development of cervical metastases in some prejudiced the final prognosis.

When metastases to the regional lymph nodes occur a radical block dissection is performed without the addition of pre-operative or postoperative radiation.

T. LECHE, M.D.

MISCELLANEOUS

Stone, R. S., Lawrence, J. H., and Asherfeld, F. G. A Preliminary Report on the Use of Fast Neutrons in the Treatment of Malignant Disease. *Radiology* 1940, 35: 322.

Neutrons are electrically neutral particles of matter each having approximately the same weight as a proton (the nucleus of the hydrogen atom). For the treatments here reported, they are produced by bombarding a target of beryllium with deuterons (nuclei of heavy hydrogen or deuterium) with energies of 8,000,000 volts. The deuterons were given their energies in the Lawrence cyclotron. The cyclotron repeatedly applies electrical impulses to deuterons moving in circular paths in a magnetic field. When the fullest possible energy has been given to the deuterons they are drawn out of the accelerating chamber by a deflecting potential to strike a beryllium target. This bombardment sets free great numbers of neutrons having energies up to 8,000,000 volts. These radiate from the target in much the same way as x-rays spread out from a target bombarded with electrons. In addition to the neutrons, gamma rays are produced when the deuterons are stopped.

Collimation of these fast neutrons into a useful beam is accomplished through definition by an outward tapering channel through a wall of paraffin (or water) more than 50 cm. thick. The accompanying gamma radiation is reduced greatly by lining the channel with 3 cm. of lead and by covering the outside of the hydrogenous thick with more than 2.5 cm. of lead. Gamma rays from the target are suppressed by lead filter 3 cm. thick in the channel.

The personnel operating the apparatus is further protected by tanks of water 3 feet thick, surrounding the whole apparatus and the treatment room. The patients are observed by mirrors.

For practical purposes a convenient arbitrary unit for measurement of the intensity of a neutron beam is that quantity of neutrons which discharges the Victoreen condenser type roentgen meter to the same extent as would 1 roentgen of x-rays. This unit has come to be called a neutron unit and is abbreviated as "n". The multiplying factor for obtaining the ionization in tissue caused by neutrons relative to that caused by x-rays is probably not more than 2.5.

The dose of neutrons to be used on patients was arrived at by a study of the comparative effects of x-rays and neutrons on biological indicators. The relative sensitivities of the different biological indicators are not the same.

The first patient treated was a man who had a carcinoma of the upper alveolar ridge invading the maxilla. A dose of 180 n, given to a field 10 by 10 cm over the left side of his face, produced much the same effect as would have been expected from 900 roentgens of 200 kv x-rays. Later 24 patients were treated, all having been given single large doses. Fractionated treatments were not possible. In general it was found that doses of from 180 to 200 n administered to fields 10 by 10 cm in size to the side of the face and neck always produced a moderate erythema which appeared between the seventh and eleventh days, deepened until about the twenty-first day, gradually changed from erythema with dry scales to pigmentation, and left very little residual change after a few months. Epilation was always produced, but varied in the time of its appearance, the average being twenty-eight days.

Doses up to 270 n did not produce blistering but did produce deeper erythemas and more marked scaling. Subsequent treatments were given only after the first reaction had completely subsided, or persisted only as pigmentation. In these cases from 125 to 270 n were given.

The cutaneous reaction was similar to that noted after the first irradiation but the height of the reaction was reached in about eighteen days. Eight patients were followed up for more than a year. The late effects have been similar to those seen after x-ray treatments of similar biological amounts.

A minimum threshold pigmentation will probably be produced by about 90 n as measured in air. This reaction is similar to that described by Quimby to occur after irradiation with 525 roentgens (measured in air) of 200 kv x-rays.

In every case there was some decrease in the size of both the primary lesions and the metastases. Six extensive ulcerating necrotic lesions of the lateral pharyngeal wall responded very little, but the cervical metastases from these decreased markedly. A carcinoma of the soft palate disappeared for a few months but recurred. Two bronchogenic carcinomas responded quite poorly. As with x-rays, the nasopharyngeal lesions responded very well. The most promising results were those obtained on the neck metastases. Those cases which had had previous x-ray therapy responded least of all, as was to be expected. Two skin carcinomas were far advanced and had had previous x-ray treatments. Eight patients have lived more than one year, but all still have their tumors. HAROLD C. OCHSNER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Isaacs, B. L., J. ng, F. T. and Ivy, A. C. Clinical Studies of Vitamin A Deficiency: Biophotometer and Adaptometer (Hecht) Studies on Normal Adults and on Persons in Whom an Attempt Was Made to Produce Vitamin A Deficiency *Arch. Opht.* 240, 24 693.

Two distinct efforts were made to produce Vitamin A deficiency in normal young adults.

In the experiment in which liquid petrolatum was used to impair Vitamin A absorption, the biophotometer was used to test dark adaptation. The instrument did not prove to be as reliable as had been anticipated. With this instrument it was impossible to detect any correlation between the dietary Vitamin A of normal subjects, their biophotometer performance, and possibly presumptive clinical signs of Hypovitaminosis A. When efforts were made to produce Vitamin A deficiency with large doses of liquid petrolatum in these subjects, no statistically reliable evidence of deficiency was detected by photometric measurements, nor were there ever any signs or symptoms of Vitamin A deficiency. Supplements of oil concentrates which provided 200,000 units of Vitamin A and 2,700 units of Vitamin D daily produced no apparent change in any of the subjects.

The second experiment was more accurately controlled through the use of a satisfactory photometer and by rigid supervision of the diet.

It was observed that the 3 subjects who lived on a deficient diet for forty-three, forty-nine and forty-nine days, respectively failed to show more than suggestion that their stores of Vitamin A were being depleted as determined by dark adaptation levels. The subjective symptoms reported by one subject (G) suggested a possible temporary hypovitaminosis beginning on the fourteenth day. Another subject (S) reported suggestive symptoms on the sixteenth to forty-second days, although his dark threshold was never greatly elevated. The third subject never gave any evidence of a deficiency.

There are reports in the literature from 7 groups of observers who have tried to produce Vitamin A deficiency in human subjects through limitation of the dietary intake of Vitamin A. Twenty-two different persons have been maintained on diets containing from 5 to 300 units of Vitamin A daily for periods ranging from twenty-five days to six months. The subjects have been tested for signs of impaired dark adaptation by the same or by a similar apparatus under similar experimental conditions. It is significant that each group has reported a difference in the time to high signs of possible deficiency appeared. One group found no evidence other than histological changes in the liver after six months on

the deficient diet. The authors' results seem to indicate failure to produce definite evidence of deficiency after forty-nine days on a daily diet containing 75 units of Vitamin A. The subjects may either have had large stores of Vitamin A or were very unsusceptible, or it takes long time to manifest definite evidence of deficiency. Another group referred to the production of recognizable changes in dark adaptation after twenty-four hours on diet with more pronounced signs after eight days.

Restoration of Vitamin A has been attempted by the administration of oil concentrates in doses varying from a single dose of 8,000 units to 300,000 units daily for several months. The results with this form of therapy have been even more variable than have been the signs of the depletion.

In view of the fact that several observers have reported a probable Vitamin A deficiency among the general population, amounting in some areas to as high as 5 per cent, it seems advisable to consider the meaning of this. The possibilities which occur to us are, (1) that the average American diet may be deficient in Vitamin A or its precursors, (2) that the standard of Vitamin A intake on which subjects are judged to be deficient is questionable and (3) that the procedures being used for measurement are recording something other than Vitamin A deficiency. We incline toward a combination of the latter two possibilities.

A large subjective factor is involved in the determinations obtained in all types of visual tests. It is our opinion that the subjective factors should be recognized and an attempt be made to control them when measurements of dark adaptation levels are made; also, that significance should not be attached to minor fluctuations in dark adaptation in terms of Vitamin A deficiency unless statistical methods are used to test the reliability and validity of differences.

PAUL STARR, M.D.

Paulino, W. Hemostasis (Self-coagulation) *Minerva med.* 240, 3 93.

After having discussed the various theories of blood coagulation the author analyzes the methods which have been used to control hemorrhage due to hemorrhagic diathesis and allied conditions. He admits that rational treatment of these conditions is not possible at the present stage of our knowledge. Therefore the following substances have been used in part empirically.

In hemophilia good results have been obtained by small repeated bleedings or by the introduction into the organism of small quantities of whole blood. Also foreign proteins have been used.

Snake venom has given good results in local treatment and in hemophilia.

Many investigators believe that some hemorrhagic diatheses are due to hypovitaminosis and

have with some success, attempted the use of vitamins, such as Vitamin C or K, or some polyvalent vitamins, adding a certain amount of calcium and lactose

4 Hormones such as ovarian extracts have also been used

5 Calcium, because of its rôle in the formation of thrombin, has been adopted in the form of calcium chloride in 10 per cent solution, which is given intravenously

6 The administration of various tissue extracts has been attempted, such as extracts from the spinal cord and muscle from pigeons

The author himself has used a preparation, widely known in some European countries and introduced by Braconnet in 1924, called "sangostop," whose active principles are the pectins of vegetable origin. Chemically, pectins are carbohydrates of high molecular weight which are probably formed by the polymerization of galacturonic acid

Paolino reports good and quick results by the injection of 10 c.c. of a 3 per cent solution per day in chronic cases and from 20 to 30 c.c. in acute cases of hemorrhage due to tubercular lesions, varicose veins of the tracheal mucus, and gastric or duodenal ulcer. Either intravenous or intramuscular injections can be used without any difference in the time of coagulation. In all patients Paolino regularly observed nearly complete arrest of bleeding after the administration of the remedy and immediate resumption of hemorrhage when the treatment was discontinued. The effect of sangostop on the bleeding time begins after twenty minutes, reaches its peak one hour later, and lasts about twenty-four hours. The influence on the time of coagulation was less remarkable than on the bleeding time. The number of platelets was remarkably increased after one injection, from 330,000 to 480,000, and was even greater after a prolonged treatment, up to 580,000 after one week of daily injections. Sangostop causes also an increase in the amount of fibrinogen, from 0.271 gr. to 0.478 gr. after one injection, and to 0.536 gr. after one week of daily injections.

The constant shortening of the bleeding time was not always correlated with an acceleration of the coagulation time and an increase in the number of platelets. The efficacy of sangostop could be remarkably improved by a complementary injection of calcium chloride.

The hemostatic action of this remedy seems to be due, according to the author, both to a direct action on the permeability of the blood capillaries and to a general stimulation of the production of platelets and fibrinogen.

NELDA CASSUTO

Ilyin, V. G. and Vavzlovskaya, E. I. The Pathogenesis of Traumatic Shock. The Oxidative Coefficient of the Urine and Blood in Experimental Traumatic Shock. *Iestnik khir.*, 1940, 59, 143

Numerous authors have described a disturbance of the oxidative processes in traumatic shock. Acid-

osis and changes in the basal metabolism serve as indirect proofs of such disturbance. The present authors employed more direct methods of evaluating the oxidative processes in their study on the pathogenesis of experimental traumatic shock. The oxidative coefficient of the urine and blood was determined in rabbits after the production of shock by hammering the muscles of the thighs without injury to the bones.

The authors found that the oxidative coefficient of the urine rises markedly after mechanical trauma has been applied to the muscles, especially the first few hours after the injury. A parallelism could be established between the gravity of the shock and the rise of the coefficient.

The oxidative coefficient of the blood and the residual nitrogen do not undergo marked changes after mechanical trauma.

The amount of blood sugar rises sharply after mechanical trauma of the muscles, the amount of lactic acid in the blood also increases. The authors were not able to establish in each instance a parallelism between the fall of the blood pressure after mechanical trauma of the muscles, and a rise of the oxidative coefficient of the urine, as well as the development of other phenomena of shock. The grave condition of the animal after serious trauma cannot be attributed to hematomas in the muscles.

A rise of the oxidative coefficient of the urine follows shock produced by repeated, interrupted stimulation of the sciatic nerves with the electric current. This observation supports the reflex theory of shock.

A marked disturbance of the oxidative processes in the organism represents one of the most important symptoms of experimental traumatic shock.

JOSEPH K. NARAT, M.D.

Shimkin, M. B., and Grady, H. G. Carcinogenic Potency of Stilbestrol and Estrone in Strain C₃H Mice. *J. Nat. Cancer Inst.*, 1940, 1, 119

The influence of various estrogens on the formation of breast tumors in mice appears to be proportional to their estrogenic activity. To elicit breast tumors in 20 per cent of male mice of a highly inbred strain, in which practically 100 per cent of the females developed spontaneous breast carcinoma, 1.2 mgm. of stilbestrol or estrone were given over a six-month period, or over about one-fourth of the life span of the animals. The weekly doses of 0.05 mgm. each were from 500 to 1,000 times the estrogenic dose for mice, and the total doses were equivalent to at least 12,000 mouse units per animal, or 400,000 units per kilogram. The mice tolerated well the large doses of the two estrogens, and no marked lesions, except breast tumors in both male and female mice and tumors of the genital tract in females, were encountered. No lesions of the lymphoid apparatus suggestive of lymphoid tumors were noted in the mice injected with estrone or stilbestrol. Enlargement of the spleen and subcutaneous lymph nodes in these mice was not of neoplastic origin.

Splenic enlargement occurred in mice bearing breast tumors and was due to varying degrees of myeloid metaplasia, which is a frequent finding in tumor-bearing mice. The enlargement of the lymph nodes appeared to be due solely to the proliferation of macrophages evoked by the injections of oily solutions.

The investigation shows that stilbestrol possesses the property common to all estrogens, of eliciting mammary carcinomas in mice of susceptible strains and that subcutaneously injected stilbestrol in sesame oil is slightly less potent in eliciting breast tumors in the strain of mice used by the authors than the same amount of estrone in peanut oil.

JOSEPH K. NARA, M.D.

Lorenz, E., and Stewart, H. L. Intestinal Carcinoma and Other Lesions in Mice Following the Oral Administration of 1, 2, 5, 6-Dibenzanthracene and 20-Methylcholanthrene. *J. Nat. Cancer Inst.* 940 7

The effect of feeding carcinogenic hydrocarbons to animals has been studied during recent years by a number of investigators. Although papillomas and carcinomas of the stomach and neoplasms in the region of the mouth have been reported in a few instances, in most cases no tumors of the gastro-intestinal tract were found even after feeding of the carcinogen for as long as ten months. In these experiments the hydrocarbon usually was dissolved in a fatty or oily substance which was mixed with the food, dropped into the back of the throat with a glass dropper or fed through a stomach tube.

The authors' investigations were undertaken for the following reasons:

To work out a simple method of oral administration of known quantities of carcinogenic hydrocarbons.

To obtain data by absorption spectrum analysis as to the fate of these hydrocarbons in the animal body.

To study the pathological changes produced by long-continued oral administration of these substances.

Two strains of mice were given orally aqueous olive-oil emulsions containing either 1,2,5,6-dibenzanthracene or 20-methylcholanthrene, instead of drinking water, for various periods of time up to thirteen months. The fate of the dibenzanthracene in the body tissue, the body fluids, and excreta was traced by absorption spectrum analysis. It was found in unchanged form in the gastro-intestinal tract to the level of the ileocecal junction. A dibenzanthracene was found in the large intestine or the feces, and none was detected in other body tissues or fluids within the limit of sensitivity to the spectrographic procedure. There is presumptive evidence, however, that absorption of the hydrocarbon from the gastro-intestinal tract occurs, which explains tumor induction in the lung.

The principal lesions observed were adenocarcinoma of the small intestine, multiple primary tu-

more of the lung, atrophy of the hemolymphatic and genital trunks, and anasarca.

JOSEPH K. NARA, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Christie, R., and Krogh, E. V. Physiological and Serological Characteristics of Staphylococci of Human Origin. *J. Path. & Bacteriol.* 100, p. 19.

A study of 30 strains of human staphylococci is a effort to relate simple test with pathogenicity reveals that no one simple procedure is infallible. The most accurate simple test is coagulase production in which all known pathogenic strains are proved to be coagulase positive. Methyl fermentation gave false positives however positive fermentation within forty-eight hours was usually indicative of "coagulase positiveness." The authors concluded that staphylococci producing local infections are different from the usual type found in the nose and mouth and are more complex antigenically.

STANLEY ROSENBERG, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Casas, M. R., and López García, A. The Study of Method of Determining Urobilin by Fluorescence With Zeiss Nephelometer Connected with Palfrich's Photometer (Estudio de un método de dosaje de la urobilina por fluorescencia, utilizando el nefelómetro de Zeiss unido al fotómetro de Palfrich). *Rev. Soc. argent. de Med.* 940, 16 301.

The authors show that the fluorescence of solutions can be measured accurately by the use of Zeiss nephelometer attached to Palfrich's photometer. The apparatus is illustrated and described.

Fluorescent solutions of urobilin in Rayer's buffer medium placed in the nephelometer show beautiful green, more or less intense, fluorescence which may be measured in comparison with the light reflected by clear glass which is placed before the other window of the nephelometer. At first sight the values do not seem to be comparable because the total light emitted by fluorescent solution is made up of three factors: (1) the light really resulting from fluorescence; (2) the light diffused from particles in suspension in the liquid (turbidity); and (3) the reflected or fluorescent light emitted by the recipient. The method of eliminating the two latter factors and arriving at the actual fluorescence is described, and graphs are given which show that the absolute fluorescence of solutions of urobilin or trypan blue is exactly proportional to their concentration.

It is impossible to eliminate the factors of turbidity and light emitted by the recipient with the naked eye; they are much greater than the absolute fluorescence. Therefore, these techniques exaggerate the value of fluorescent luminosity, which can be determined accurately only with the nephelometer fluorometer.

AUGUSTO G. MOMAY, M.D.

Castex, M R, and López García, A A Comparative Study of the Estimation of Urobilin as Urobilinogen by the Method of Watson and Hellmeyer and by Fluorescence, with Zeiss' Nephelometer and Pulfrich's Photometer (Estudio comparativo del dosaje de la urobilina como urobilínógeno, por el método de Watson y Hellmeyer y por fluorescencia, utilizando el nefelómetro de Zeiss y el fotómetro de Pulfrich) *Rev Soc argent de biol*, 1940, 16 311

In a previous article the authors have described a method of using Zeiss' nephelometer attached to Pulfrich's photometer for determining the fluorescence emitted by urobilin dissolved in Royer's buffer medium. In this article they discuss the comparative results obtained by using this method and the method of determining urobilin in the form of urobilinogen by the method of Watson and Hellmeyer. Graphs and tables showing the details of the results are given.

They conclude from these results that the maximum normal urobilinuria for twenty-four hours is 0.80 mgm and that the determination of urobilin by the fluorescent method is more accurate than the determination of urobilinogen by the method of Watson and Hellmeyer and the use of Ehrlich's reagent.

AUDREY G MOROAN, M D

EXPERIMENTAL SURGERY

Spink, W W, and Hansen, A E Sulfathiazole
J Am M Ass, 1940, 115 840

In the course of studies on 128 subjects suffering from a variety of infections, Spink and Hansen compared sulfathiazole with sulfanilamide and sulfapyridine as regards its pharmacology, toxicology, and therapeutic effectiveness. The question of toxicity is of considerable importance. Thus far, in their experience, the authors found that sulfathiazole appears to be no more toxic than either sulfanilamide or sulfapyridine. In fact, troublesome nausea and vomiting which not infrequently follow the administration of sulfapyridine are not so commonly encountered when sulfathiazole is used. The incidence of dermatitis, however, is greater following the use of sulfathiazole than after the use of either sulfanilamide or sulfapyridine.

As regards the therapeutic phase of the study, it appears that sulfathiazole has the same value as sulfapyridine in the treatment of pneumococcal pneumonia. Sulfapyridine seems to cause a more abrupt fall in temperature than sulfathiazole, however, there is some evidence that sulfapyridine may have a non-specific antipyretic effect. When sulfapyridine was given to febrile patients who had fever not due to an infectious agent, a prompt decrease in the temperature was noted, which in turn was followed by a rise when the drug was omitted. This was true especially in a case of lymphatic leucemia in which there was no evidence of an infection. Whether or not sulfathiazole is as valuable as sulfapyridine in the therapy of pneumococcal meningitis as well as the value of topical application of

sulfathiazole for localized staphylococcal lesions may be determined only by further investigation.

There is no doubt, however, that sulfathiazole is more effective than sulfapyridine in the treatment of staphylococcal septicemia and appears to be the best therapeutic agent available for this infection at the present time. Sulfathiazole appears to be of especial value in the treatment of infections of the urinary tract due to the bacillus proteus, alpha hemolytic streptococcus, escherichia coli, and the staphylococcus. Its use may result in sterile cultures of urine when sulfanilamide therapy has been ineffective.

J M MORA, M D

Rake, G, Van Dyke, H B, and Corwin, W C Pathological Changes Following Prolonged Administration of Sulfathiazole and Sulfapyridine *Am J M Sc*, 1940, 200 353

Sulfathiazole, when given as 2 per cent of the diet, killed 77 per cent of the mice receiving it during a four-week period, and produced lesions chiefly in the spleen and genito-urinary tract. Sulfapyridine was not lethal, and produced fewer pathological changes.

In rats, sulfapyridine was twice as toxic as sulfathiazole, as shown both by the effect on the growth curve and by the lesions produced in the genito-urinary tract.

In monkeys which received a single daily dose, sulfapyridine was more toxic than sulfathiazole, as shown by the lesions in the genito-urinary tract and, to a lesser extent, by loss of weight and leucopenia.

SAMUEL KAHN, M D

Cope, O, and Kapnick, I The Relation of Endocrine Function to Resistance and Immunity The Changes in Complement and Response to Vaccina Following Alterations in Thyroid, Adrenal, and Pituitary Function in the Rabbit and Dog *Endocrinology*, 1940, 27 533

The course of infection in patients suffering from certain endocrine disturbances is frequently more virulent than in normal individuals. The authors believe that this difference may be due to non-specific physiological abnormalities which are secondary rather than primary to the endocrine dysfunction.

Quantitative studies were made of the titrations of complements in the blood serum of the rabbit and dog, and of the reaction in the rabbit to injection of vaccina, associated with experimental endocrine dysfunction.

A direct relation between thyroid function and complement concentration in the blood serum of rabbits was observed. The complement concentration decreased following thyroidectomy. Hyperthyroidism induced by thyroxine was associated with a rise in the complement concentration.

A similar decrease in complement concentration followed hypophysectomy in rabbits. Adrenalectomy was followed by no change in complement concentration in the rabbit and dog.

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The response to vaccinia virus was not altered in the rabbit by thyroidectomy or injections of thyroxine. A delayed response followed adrenalectomy and a diminished response followed hypophysectomy.

EDWARD W. GROSS, M.D.

554a, J. J. Plasma Transfusion in Experimental Intestinal Obstruction. *Ann. Surg.* 940, 34.

Five dogs subjected to intestinal distention at a pressure of 30 cm. of water were given plasma intravenously and continuously to replace part or all of the anticipated loss of plasma as determined from previous data already published. Effective maintenance of the control plasma volume occurred when the intravenous supply of plasma as known to be adequate.

Interruption of administration of plasma was followed by a drop in plasma volume sufficient to cause death. The survival time of these dogs was prolonged from an expected average of twenty to eight tenths hours for dogs with distention not receiving plasma to forty or more hours.

The intravenous injection of physiological saline solution, in an amount sufficient or more than sufficient to replace the fluid lost under the conditions of the author's experimental technique, confers no noticeable benefit.

Loss of plasma continues as long as distention continues in the obstructed small intestine of the dog. The extent of this loss, if uncompensated, is sufficient to itself cause death, and is of primary importance in the pathological physiology of intestinal obstruction.

CHARLES BABCOCK, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 72

APRIL, 1941

NUMBER 4

PRINCIPLES OF SURGICAL PRACTICE

THE IMPORTANCE OF INTRAPLEURAL PRESSURE IN THORACIC SURGERY, PHYSIOLOGICAL AND CLINICAL CONSIDERATIONS

DAN W MYERS, M D, and BRIAN BLADES, M D, St Louis, Missouri

REFINEMENTS in surgical technique have inevitably resulted in more frequent and more successful application of operative therapy to the management of tuberculous, suppurative, and neoplastic diseases of the chest. During the past two decades traumatic injuries of the thorax have also become commonplace in civil life as a consequence of the increasing popularity and accelerated pace of automotive transportation on our highways. Appreciable alteration of the intrapleural pressure, which may be either transient or permanent, is usually attendant on major thoracic operations and extensive traumatism of the chest. Such modifications of the pressure within the thorax may exert a profound effect on both the circulatory and respiratory functions. Awareness of the serious consequences of incision into the thorax is reflected in the ancient writings of Celsus (7). In modern times the development of thoracic surgery is impeded by the difficulty in overcoming the effects of disturbed intrapleural pressures, and it is imperative that the surgeon possess a thorough understanding of the physiological mechanisms and their relation to clinical situations.

PHYSIOLOGICAL CONSIDERATIONS

I INCREASE IN INTRAPLEURAL PRESSURE

Although modification in either direction may occur, elevation (reduction in the negativity) of

the intrapleural pressure is most commonly encountered by the surgeon. Increase in the intrapleural pressure is a constant accompaniment of incision through a non-adherent parietal pleura and also of those procedures, grouped collectively under the term "collapse therapy," which are designed to accomplish a reduction in lung volume. The mechanisms capable of creating an increase in intrapleural pressure include (1) the introduction of air, oil, paraffin, or other foreign substance into the thoracic cage, (2) induced paralysis of the inspiratory muscles, (3) the interruption of the bony framework of the thorax by rib removal, and (4) compression of the chest by external pressure or by pressure applied against the inferior surface of the diaphragm.

Effects on respiration The normal lung is a highly elastic organ which is maintained in an expanded state by virtue of the partial vacuum existing between the visceral and parietal layers of the pleura. Since the lung is in fact subjected to a considerable elastic tension or stretching, its retraction follows any reduction in negativity of the intrapleural pressure. Collapse of the lung may, therefore, ensue without the application of a compressing force actuated by a pressure greater than that of the atmosphere. This concept of pulmonary collapse by relaxation is of fundamental importance in artificial pneumothorax therapy for tuberculosis, during which extensive reduction in lung volume occurs under subatmospheric pressures provided that adhesions between the pleural leaves are absent. In 1918 Graham and Bell (17)

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proved that the effects of increasing the pressure within a hemithorax were not confined to the one side. Their experimental studies demonstrated that a unilateral pneumothorax produces an elevation of the pressure in the contralateral pleural space and concomitantly a shrinkage in size of the contralateral lung in the normal thorax. They emphasized also that the degree of transmission of pressure changes from one pleural space to the opposite depends chiefly upon the flexibility of the mediastinum. The normal human mediastinum is freely mobile within certain limits; consequently the creation of a pneumothorax on one side results in a rise in the intrapleural pressure on the other side of nearly the same degree as that induced on the side of air injection. The greater the thickening and inflammatory fixation of the mediastinal partition, the less marked are the effects on the contralateral intrapleural pressure and lung volume.

Coincident with the diminution of pulmonary volume attendant upon elevation of the intrathoracic pressure there occurs a decrease of vital capacity. This alteration in the vital capacity must be regarded as the most significant effect of chest surgical operations upon the physiology of respiration. The vital capacity which is determined by a spirometric recording of the volume of a maximal expiration following the greatest possible inspiration, constitutes a fairly accurate index of the efficiency of the respiratory apparatus. Distressing dyspnea usually becomes manifest when vital capacity is reduced to a figure less than three times that of the individual tidal air requirement, and life obviously cannot be maintained when the maximal inspiratory effort fails to provide the necessary volume of tidal air. The most important factors determining the patient's ability to withstand unilaterally induced change in intrapleural pressure are (1) the degree to which the alteration is transmitted to the opposite pleural space, controlled principally by the mobility of the mediastinum, and (2) the individual's vital capacity prior to production of the disturbance.

Brauer (6) postulated a mechanism of rebreathing which he termed *pendelluft* as an explanation for the anoxemia produced by open pneumothorax. This concept, supported by observations of expansion of the lung on the pneumothorax side during expiration, hypothesizes the transfer of air from one lung to the other. During the expiratory phase of respiration, air from the lung on the sound side is presumed to enter the pneumothorax lung, the same gaseous mixture being reaspirated into the more actively functioning

lung during the succeeding inspiration. Conceivably such paradoxical respiration would lower the alveolar oxygen tension and increase the carbon-dioxide concentration. Various thoracic surgeons differ in their opinions as to the relative importance of pendulum respiration as against altered intrapleural pressure and pulmonary collapse in the causation of the harmful effects of incision into the thorax. The antibiotic views of Graham and Duval will receive further consideration in the discussion of open thoracotomy.

Effects on the circulation. Graham (7) and Kountz, Alexander, and Dowell (11) have shown that an increase in intrapleural pressure produced an elevation of venous pressure. More profound effects are produced by changes in tension within the right pleural space since they are more directly applied to the right auricle and great veins. The resistance in the pulmonary circuit is also increased. In consequence of the increase in venous pressure, which may be of considerable extent when the intrapleural pressure becomes positive as in the Valsalva experiment, the return of the blood to the heart is diminished. The systolic output must diminish in accordance with the decreased diastolic inflow and therefore the systolic blood pressure falls. Head (20) has stressed the exaggeration of the Traube-Hering or respiratory waves in the blood pressure which occurs with increase in intrapleural tension, the arterial pressure being depressed more during the inspiratory than in the expiratory phase of respiration.

To-and-fro movements of the mediastinum motivated by inequality of pressure in the two hemithoraces aggravate the circulatory effects of pressure upon the heart and great veins. When the mediastinal excursions are sufficiently wide a periodic kinking results together with obstruction of both the superior vena cava above and the inferior vena cava below. Doley and Wiese found that the lymphatic circulation is also slowed (12). No important detrimental effects, however have been recognized. In fact, it is conceivable that a stimulation of fibrous-tissue production may be a beneficial result of lymph stasis in the tuberculous patient.

3. DECREASE IN INTRAPLEURAL PRESSURE

Obstructions or constrictions of the trachea or bronchi cause fall in the intrapleural pressure. Such increases in the negativity of the pressure have been observed clinically and experimentally during attacks of bronchial asthma, in lobar telecystosis and massive collapse and after the administration of bronchoconstrictor drugs (15). The decrease in intrapleural pressure is most

significant as a symptom indicative of the reduction in caliber of the respiratory passages. Certain important physiological changes may, however, be directly attributable to the alteration in pressure. The marked displacement of the mediastinum and its contents which often accompanies the heightened negativity of intrapleural pressure in unilateral pulmonary atelectasis may induce kinking of the great vessels, and—particularly if long maintained—the resultant strain on the myocardium may contribute to the development of cardiac decompensation. Although it has long been assumed that the pulmonary emphysema of chronic bronchial asthma is due to obstruction to the escape of alveolar air during expiration, the great negativity of inspiratory pleural pressure during asthmatic seizures may constitute an important factor in the production of alveolar dilatation and rupture. Isolated case reports indicate that spontaneous pneumothorax occasionally complicates massive collapse of the lung. Escudero and Adams (16) produced pneumothorax in dogs experimentally by obstructing a bronchus and creating an atelectasis with its attendant decrease in intrathoracic pressure. Modern concepts stress the importance of chronic lobar collapse in the pathogenesis of bronchiectasis. According to Andrus (3) the elastic hypertension associated with lowered intrapleural pressure is of fundamental importance in the development of bronchial dilatation.

CLINICAL CONSIDERATIONS

I EMPYEMA THORACIS

The term "empyema thoracis" denotes the formation of an abscess in the pleural space. The drainage of the purulent accumulation is as essential in the management of empyema as in the therapy of pyogenic abscess situated elsewhere in the body. In order to accomplish drainage of pyogenic purulent effusions of the pleural space, three methods have been widely employed: (1) open drainage by rib resection, (2) closed drainage accomplished through an intercostal catheter connected to a water-sealed drainage bottle, and (3) evacuation by repeated thoracentesis. Open drainage following rib removal has gained the widest acceptance both because it provides a larger opening which facilitates more prompt and more complete evacuation of the abscess and because it does not require complicated apparatus. Successful application of open drainage, however, requires close observance of the physiological principles elucidated by Graham and Bell in 1918. They concluded that the premature estab-

lishment of open drainage during the early formative stage of pyogenic empyema was a dangerous undertaking, and that early operation was largely responsible for the high mortality rate in streptococcus empyema observed in the American army during the winter of 1917. At their onset, pyogenic effusions lie free and unencapsulated in the pleural space, so that incision through the parietal pleura allows access of air to the entire pleural cavity and creates an open pneumothorax. The primary effect of this open pneumothorax is a reduction in the vital capacity of the individual. Another harmful consequence is the induced to-and-fro movement of the mediastinum with its attendant pendulum respiration and deleterious effect upon the circulation. It must be remembered that pneumonic consolidation is still persistent in the early stage of empyema formation, and the consequences of open pneumothorax are far more serious when the vital capacity and general condition of the patient are already impaired by the existence of the acute inflammatory process in the lung. With the passage of time, the purulent effusion becomes encapsulated and firm pleural adhesions prevent the induction of a general pneumothorax when incision for drainage is carried out. Inflammatory induration and thickening of the mediastinum also develop with the passage of time, so that alteration of the intrapleural pressure on the affected side is less readily transmitted to the contralateral lung. A simple means for estimating the safety of open drainage operation consists in the observation of pus aspirated from the empyema pocket. When it is found that purulent exudate makes up more than two-thirds of the volume of the fluid which has been permitted to stand in a small test tube, one can feel assured that sufficiently firm encapsulation of the fluid and adequate stabilization of the mediastinum has occurred to prevent the development of open pneumothorax and the creation of a marked diminution in vital capacity by the drainage operation. One not infrequently encounters severe dyspnea or other marked pressure effects in a patient with pyogenic empyema before the stage of formation of thick pus. It is permissible to relieve the pressure by aspiration of the fluid through a needle until such a time as the consistency of the aspirated pus denotes that the abscess is localized. Drainage by a closed system is also applicable in early cases of empyema before frank pus has appeared. The negative intrapleural pressure is restored and maintained by a water-sealed system for closed drainage, since the apparatus operates on the principle of the siphon. Various surgeons have deemed it

advisable to supplement the siphon bottle with an apparatus capable of maintaining a constant negative pressure above minus 1 cm. of water (31). More rapid removal of pus and speedier obliteration of the empyema pocket are said to result from the application of suction.

2. OPEN THORACOTOMY

Management of operation. Major operations upon the thoracic contents usually necessitate the creation of a large unilateral chest opening, and it has long been realized that such incisions into the pleural space constitute a hazard to life. The dangers of open thoracotomy depend primarily upon the altered intrathoracic pressure relationships and other physiological disturbances attendant on the production of an open pneumothorax. The ability of the individual to tolerate the induced diminution of vital capacity pending hum respiration, and circulatory changes is also of paramount importance.

The earliest attempts to conquer the effects of elevation of the intrapleural pressure comprised the construction of chambers designed to enclose the body of the patient (16) (19). By partial exhaustion of the air from such a chamber it became possible to maintain a negative pressure in the opened thoracic cavity. Separate positive pressure compartments were sometimes employed to enclose the head of the patient in order to raise the intrabronchial pressure and further obviate the tendency toward collapse of the lungs. The technical difficulties and expense encountered in the operation of such chambers were tremendous. In order to maintain the vacuum the negative pressure compartment must either be made sufficiently large to enclose the operating team as well as the patient, or the surgeon must face the problem of carrying out his manipulations through narrow rubber-cuffed sleeve portures in the chamber.

The insertion of an intratracheal tube for conduction of the anesthetic mixture was proved practicable by the animal experimentation of Meitzer and Auer (3) and was introduced into thoracic surgery by Elsberg (15). It is feasible to deliver gaseous mixture through the endotracheal catheter under pressures greater than 1 atmospheric, maintaining lung inflation by preventing the intrabronchial pressure to level above that existing in the opened pleural space. Positive pressure may also be applied through a closely fitting face mask. The face piece however lacks certain advantages of the endotracheal tube which maintains clear airway provides for the direct aspiration of accumulated secretion

from the trachea, and ensures transmission of positive pressure to the tracheobronchial tree. Cotton and Boothby (10) early pointed out the danger from the application of excess pressure in intratracheal insufflation anesthesia. Recently Adams (1) has considered the potential hazards in greater detail. Rupture of an alveolus with the production of emphysema of the interstitial pulmonary tissues and mediastinum may result from excessively high intrabronchial pressures (2) (31). Tear of the visceral pleura with development of a contralateral pneumothorax has also been reported as a sequel to thoracic operations performed under endotracheal anesthesia (30). While these accidents are serious complications, they do not occur frequently if moderate pressures below 10 mm. of mercury are employed. Strong manual pressure by the anesthetist on the breathing bag must be avoided. Endotracheal tubes are sometimes enveloped in inflatable rubber cuffs, and a fatality following a tear of the trachea due to rupture of such a cuff has been reported (32).

Positive-pressure anesthesia with a constantly flowing gas mixture is the method in general use today for the performance of open thoracotomy. In addition to the risks enumerated above, the method possesses the disadvantage of impeding adequate pulmonary ventilation. While lung inflation can readily be maintained, ventilation is hampered by the difficulties involved in the act of expiration against positive pressure. Despite straining efforts of the patient the respiratory minute volume is usually low under the constant flow of the endotracheal anesthesia. An effective solution of the problem of maintaining ventilation consists in the perfection of apparatus capable of performing rhythmical insufflation. Recently Crafoord () has reported the development of such machine which has functioned satisfactorily in 94 clinical cases.

The necessity for use of special apparatus to maintain inflation of the lungs has been seriously questioned by Duval (13). Indeed the experiences of other surgeons in the successful performance of open thoracotomy under spinal anesthesia have demonstrated that the human hemithorax may frequently be widely exposed without calumity (4). Duval claimed that a small incision into the pleural space produced more serious disturbance of the respiration than wide opening of the chest. According to his viewpoint, distention of the mediastinum is chiefly responsible for the respiratory distress associated with open pneumothorax, and as the size of the chest opening is increased the stabilization of the mediastinal par-

appearance and certain pressure levels. Variability of the relationship of the collapse produced to the intrapleural pressures created in any pneumothorax patient is determined principally by the following factors (1) adhesions between the visceral and parietal pleura, (2) the elasticity of the lung, and (3) the mobility of the mediastinum. Adhesions limit the size of the pneumothorax pocket, so that in their presence a given amount of air will produce a greater than normal elevation in intrapleural pressure. We have repeatedly seen marked increase in the size of the pneumothorax cavity and the extent of pulmonary collapse without increase of the intrapleural pressure follow the successful division of pleural adhesions by closed intrapleural pneumolysis. The rapidity of pressure rise with a standard volume of injected gas is in inverse ratio to the elasticity of the lung. Christie and McIntosh (8) measured pulmonary elasticity by simultaneous calculation of the tidal air volume and intrapleural pressure. It may be assumed that the difference between expiratory and inspiratory pleural pressures approximates the distending force applied to the lung during inhalation. Pulmonary distensibility (elasticity) might, therefore, be expressed as a ratio of the volume of air inspired to the distending force or change in intrapleural pressure.

We have on many occasions observed that the majority of pneumothorax patients exhibiting thick visceral pleura and densely fibrotic lungs in the roentgenogram show marked respiratory excursions of pleural pressure during quiet breathing. Further it is customary to find that marked rises in mean pleural pressure follow the injection of relatively small quantities of gas into the pneumothorax spaces surrounding such inelastic lungs. The importance of mediastinal fixation in determining the relation of the degree of collapse of the ipsilateral lung to the elevation of pressure produced by an inflation is obvious. When the mediastinum is mobile the increases in intrapleural pressure are shared by both pleural sacs. Rigidity of the mediastinum limits the effects of pneumothorax principally to the side of the air injection, and the intrapleural pressure on this side is therefore elevated to a greater extent by each therapeutic inflation.

In the absence of pleural adhesions excellent collapse may be achieved with subatmospheric intrapleural pressures. Repeated successful experiences under these conditions lend credence to the contention that relaxation of contracting scar tissue with its centrifugal pull on the cavity walls is of fundamental importance in the production

of cavity closure. Actual compression of a lung by creating a pressure above the atmospheric has in our experience increased certain complications of pneumothorax therapy notably herniation of the mediastinum, effusion, and empyema, and we, therefore, avoid the use of high pressure. The lung on the side of a closed intrapleural pneumothorax is seldom completely immobilized. So long as the intrapleural pressure may be rendered negative in the inspiratory phase the lung is capable of performing a respiratory function. These considerations explain the practicality of bilateral pneumothorax in selected patients.

Careful observation and recording of intrapleural pressure may reveal the existence of a small fistulous communication between the lung and the pleura. Large fistulas render the pressures intrapulmonic small and intermittent leaks are associated with persistence of pulmonary collapse and relatively high intrapleural pressures maintained for long periods without air refills. The importance of detection of these pleuropulmonary perforations lies in the fact that they ultimately lead to the production of tuberculous empyema in the majority of instances. Corydon (9) pointed out that analysis of the pneumothorax gases is more exact in diagnosis of the smaller fistulas than are pressure determinations.

The development of a fluid empyema in the pneumothorax space is a frequent complication. When the empyema becomes large in amount it causes an unfavorable redistribution of pressure relationships, since the hydrostatic effect of the fluid tends to create the highest pressure over the most dependent portion of the thorax whereas the tuberculous process which one desires to collapse is usually situated in the upper portion of the thorax. It is also true that empyema may provoke adhesion formation and subsequently limit the capacity of the pocket despite the maintenance of high intrapleural pressure. During the reexpansion period after voluntary abandonment of pneumothorax it is not unusual to remark the appearance of pleural fluid. Such reexpansion exudates develop by predilection in patients with relatively fibrotic lungs who have markedly negative intrapleural pressures when air refills are discontinued. The fluid may perhaps represent a transudate *ex vacuo* which is literally sucked into the pleural space by the highly negative pressure.

Phrenic nerve interruption ordinarily produces a definite elevation of the intrapleural pressure. The change is usually proportionate to the resultant upward displacement of the diaphragm. Haight and Deegan (18) found an average rise of

2.4 cm. of water in mean intrapleural pressure in a group of 7 pneumothorax patients subjected to ipsilateral hemidiaphragmatic paralysis.

Thoracoplasty involves the surgical extirpation of ribs or rib segments with the object of obliterating empyema cavities or collapsing tuberculous lung tissue. The dissection employed in the resection of ribs for the treatment of pulmonary tuberculosis is extrapleural. There is no occasion therefore to make provision for positive pressure anesthesia. Exact data on the effect of thoracoplasty on the intrapleural pressure are difficult to obtain, since the operation is seldom attempted in patients with free pleural spaces suitable for pressure determinations. It is, furthermore, the accepted practice to discontinue an ineffective pneumothorax and permit complete reexpansion of the lung before proceeding with thoracoplastic collapse, and therefore there is not a convenient air pocket available for postoperative pressure measurements. On 2 occasions when thoracoplasty was performed over a pneumothorax, we have found that the intrapleural pressures which were previously below atmospheric pressure, became positive following rib removal. If fluid or air is present in the pleural cavity pre-operatively, efforts should always be made to aspirate it or to determine the intrapleural pressure on the operating table after closure of the incision. The additional elevation ensuing upon the thoracoplastic collapse may raise the intrapleural pressure to dangerous levels.

The mechanism of collapse by thoracoplasty does not depend upon positive pressure compression of the lung. The objective is the performance of an extensive decostalization of the thoracic wall, which permits the soft tissues to retract and the underlying lung to relax under atmospheric pressure. Mobilization of the apex of the lung (apicolysis) may have merit in some cases by virtue of the more complete retraction of the upper lung which ensues when the fascial attachments to the apical pleura are released. Many of the braces devised for application over the decostalized areas of the chest provide positive pressure. The chief advantages of a brace, however, consist in its ability to minimize paradoxical respiratory movements of the chest wall and its capacity to maintain the soft tissues in the retracted position created by operation until rib regeneration provides a relatively rigid costal wall at the depressed level.

Paradoxical respiratory movement of the chest wall following extensive rib resection constitutes one of the most dangerous physiological disturbances produced by thoracoplasty. The soft tis-

ues over the decostalized areas tend to fall inward is the negative intrathoracic pressure is increased during inspiration. The greater negativity of pressure in the opposite pleural space during the inspiratory phase creates a movement of the mediastinum toward the contralateral side. During expiration the mediastinum, collapsed lung, and decostalized chest wall shift in the opposite direction. There exists, therefore, both a to-and-fro movement of the mediastinum, which has a deleterious action on the circulation, and a tendency to pendulum respiration which causes anoxemia. A fall in the blood pressure, acceleration of the pulse, dyspnea, cyanosis, and collapse are among the signs associated with extensive paradoxical movement. It must be recognized, of course, that operative shock, autotuberculinization, spreading tuberculous disease, and other factors may also account for similar postoperative syndromes. Oxygen, blood transfusion, and snug stripping over the affected area constitute the usual therapy for this postoperative difficulty. Alexander (2) successfully employed the Drinker respirator to overcome paradoxical movement and associated severe post-thoracoplastic shock.

Extrapleural pneumolysis consists in the surgical creation of a space between the parietal pleura and the loose fascial covering of the inner surface of the bony thoracic cage. Pulmonary collapse is achieved by manual depression of the lung and is maintained by the introduction of various foreign substances into the pocket thus established. The recent popularity of air filling (extrapleural pneumothorax) has made possible the study of pressure relations in this intrathoracic extrapleural space. The behavior of pressures is similar to that in a limited intrapleural pneumothorax. Positive pressures between 10 and 20 cm. of water are achieved and usually must be maintained to prevent reexpansion. Extrapleural pneumolysis represents a compression type of collapse in contrast to the relaxation collapse achieved at lower intrathoracic pressures by other methods of therapy. It is rather generally conceded that more satisfactory results are secured by a good intrapleural pneumothorax or a thoracoplasty, but it is not certain that this difference in clinical accomplishments is a manifestation of the difference in pressure mechanisms involved.

4. TRAUMATIC INJURIES OF THE THORAX

Both penetrating and non-penetrating injuries of the chest may produce significant alterations in the intrathoracic pressures.

Large wounds extending through the parietal pleura produce open pneumothorax unless there

appearance and certain pressure levels. Variability of the relationship of the collapse produced to the intrapleural pressures created in any pneumothorax patient is determined principally by the following factors. (1) adhesions between the visceral and parietal pleura, (2) the elasticity of the lung, and (3) the mobility of the mediastinum. Adhesions limit the size of the pneumothorax pocket, so that in their presence a given amount of air will produce a greater than normal elevation in intrapleural pressure. We have repeatedly seen marked increase in the size of the pneumothorax cavity and the extent of pulmonary collapse without increase of the intrapleural pressure follow the successful division of pleural adhesions by closed intrapleural pneumolysis. The rapidity of pressure rise with a standard volume of injected gas is in inverse ratio to the elasticity of the lung. Christie and McIntosh (8) measured pulmonary elasticity by simultaneous calculation of the tidal air volume and intrapleural pressure. It may be assumed that the difference between expiratory and inspiratory pleural pressures approximates the distending force applied to the lung during inhalation. Pulmonary distensibility (elasticity) might, therefore, be expressed as a ratio of the volume of air inspired to the distending force or change in intrapleural pressure.

We have on many occasions observed that the majority of pneumothorax patients exhibiting thick visceral pleurae and densely fibrotic lungs in the roentgenogram show marked respiratory excursions of pleural pressure during quiet breathing. Further it is customary to find that marked rises in mean pleural pressure follow the injection of relatively small quantities of gas into the pneumothorax spaces surrounding such inelastic lungs. The importance of mediastinal fixation in determining the relation of the degree of collapse of the ipsilateral lung to the elevation of pressure produced by an inflation is obvious. When the mediastinum is mobile the increases in intrapleural pressure are shared by both pleural sacs. Rigidity of the mediastinum limits the effects of pneumothorax principally to the side of the air injection, and the intrapleural pressure on this side is therefore elevated to a greater extent by each therapeutic inflation.

In the absence of pleural adhesions excellent collapse may be achieved with subatmospheric intrapleural pressures. Repeated successful experiences under these conditions lend credence to the contention that relaxation of contracting scar tissue with its centrifugal pull on the cavern walls is of fundamental importance in the production

of cavity closure. Actual compression of a lung by creating a pressure above the atmospheric has in our experience increased certain complications of pneumothorax therapy notably herniation of the mediastinum, effusion, and empyema, and we therefore avoid the use of high pressure. The lung on the side of a closed intrapleural pneumothorax is seldom completely immobilized. So long as the intrapleural pressure may be rendered negative in the inspiratory phase the lung is capable of performing a respiratory function. These considerations explain the practicability of bilateral pneumothorax in selected patients.

Careful observation and recording of intrapleural pressure may reveal the existence of a small fistulous communication between the lung and the pleura. Large fistulas render the pressures intrapleural, small and intermittent leaks are associated with persistence of pulmonary collapse and relatively high intrapleural pressures maintained for long periods without air refill. The importance of detection of these pleuropulmonary perforations lies in the fact that they ultimately lead to the production of tuberculous empyema in the majority of instances. Coryles (9) pointed out that analysis of the pneumothorax gases is more exact in diagnosis of the smaller fistulas than are pressure determinations.

The development of a fluid exudate in the pneumothorax space is a frequent complication. When the exudate becomes large in amount it causes an unfavorable redistribution of pressure relationships, since the hydrostatic effect of the fluid tends to create the highest pressure over the most dependent portion of the thorax whereas the tuberculous process which one desires to collapse is usually situated in the upper portion of the thorax. It is also true that exudate may provoke adhesion formation and subsequently limit the capacity of the pocket despite the maintenance of high intrapleural pressure. During the reexpansion period after voluntary abandonment of pneumothorax it is not unusual to remark the appearance of pleural fluid. Such reexpansion exudates develop by predilection in patients with relatively fibrotic lungs who have markedly negative intrapleural pressures when air refills are discontinued. The fluid may perhaps represent a transudate *ex vacuo* which is literally sucked into the pleural space by the highly negative pressure.

Phrenic nerve interruption ordinarily produces definite elevation of the intrapleural pressure. The change is usually proportionate to the resultant upward displacement of the diaphragm. Haight and Deegan (8) found an average rise of

2.4 cm of water in mean intrapleural pressure in a group of 7 pneumothorax patients subjected to ipsilateral hemidiaphragmatic paralysis

Thoracoplasty involves the surgical excision of ribs or rib segments with the object of obliterating empyema cavities or collapsing tuberculous lung tissue. The dissection employed in the resection of ribs for the treatment of pulmonary tuberculosis is extrapleural. There is no occasion, therefore, to make provision for positive-pressure anesthesia. Exact data on the effect of thoracoplasty on the intrapleural pressure are difficult to obtain, since the operation is seldom attempted in patients with free pleural spaces suitable for pressure determinations. It is, furthermore, the accepted practice to discontinue an ineffective pneumothorax and permit complete reexpansion of the lung before proceeding with thoracoplastic collapse, and therefore there is not a convenient air pocket available for postoperative pressure measurements. On 2 occasions when thoracoplasty was performed over a pneumothorax, we have found that the intrapleural pressures, which were previously below atmospheric pressure, became positive following rib removal. If fluid or air is present in the pleural cavity pre-operatively, efforts should always be made to aspirate it or to determine the intrapleural pressure on the operating table after closure of the incision. The additional elevation ensuing upon the thoracoplastic collapse may raise the intrapleural pressure to dangerous levels.

The mechanism of collapse by thoracoplasty does not depend upon positive-pressure compression of the lung. The objective is the performance of an extensive decostalization of the thoracic wall, which permits the soft tissues to retract and the underlying lung to relax under atmospheric pressure. Mobilization of the apex of the lung (apicolysis) may have merit in some cases by virtue of the more complete retraction of the upper lung which ensues when the fascial attachments to the apical pleura are released. Many of the braces devised for application over the decostalized areas of the chest provide positive pressure. The chief advantages of a brace, however, consist in its ability to minimize paradoxical respiratory movements of the chest wall and its capacity to maintain the soft tissues in the retracted position created by operation until rib regeneration provides a relatively rigid costal wall at the depressed level.

Paradoxical respiratory movement of the chest wall following extensive rib resection constitutes one of the most dangerous physiological disturbances produced by thoracoplasty. The soft tis-

ues over the decostalized areas tend to fall inward as the negative intrathoracic pressure is increased during inspiration. The greater negativity of pressure in the opposite pleural space during the inspiratory phase creates a movement of the mediastinum toward the contralateral side. During expiration the mediastinum, collapsed lung, and decostalized chest wall shift in the opposite direction. There exists, therefore, both a to-and-fro movement of the mediastinum, which has a deleterious action on the circulation, and a tendency to pendulum respiration which causes anoxemia. A fall in the blood pressure, acceleration of the pulse, dyspnea, cyanosis, and collapse are among the signs associated with extensive paradoxical movement. It must be recognized, of course, that operative shock, autotuberculinization, spreading tuberculous disease, and other factors may also account for similar postoperative syndromes. Oxygen, blood transfusion, and snug strapping over the affected area constitute the usual therapy for this postoperative difficulty. Alexander (2) successfully employed the Drinker respirator to overcome paradoxical movement and associated severe post-thoracoplastic shock.

Extrapleural pneumolysis consists in the surgical creation of a space between the parietal pleura and the loose fascial covering of the inner surface of the bony thoracic cage. Pneumolysis is achieved by manual depression of the lung and is maintained by the introduction of sterile foreign substances into the pocket thus established. The recent popularity of air films (a type of pneumothorax) has made possible the study of pressure relations in this intrathoracic extrapleural space. The behavior of pressure is similar to that in a limited intrapleural pneumothorax. Positive pressures between 10 and 20 cm of water are achieved and usually must be maintained to prevent reexpansion. Extrapleural pneumolysis represents a compression type of collapse, in contrast to the relaxation collapse achieved by intrathoracic pressures by the use of negative pressure therapy. It is rather generally agreed that more satisfactory results are obtained in the intrapleural pneumothorax than in the extrapleural pneumolysis, but it is not certain that this difference in accomplishments is a manifestation of a difference in pressure mechanisms.

4 TRAUMATIC INJURIES OF THE CHEST

Both penetrating and non-penetrating injuries of the chest may produce significant changes in the intrathoracic pressures.

Large wounds extending through the chest wall produce open pneumothorax.

is firm symphysis between the visceral and parietal surfaces of the serous membrane. The seriousness of this disturbance is portrayed by the high mortality rate of such traumatism during the first twenty-four hours. Infection of the lung or pleura may develop later but open pneumothorax superimposed on shock and hemorrhage constitutes the chief immediate hazard to the life of an individual with an open sucking chest wound. Such wounds must, therefore, be closed without delay and with but scant regard for the possibility of subsequent pleural infection. Transforming an open to a closed pneumothorax decreases the mediastinal mobility and pendulum respiration. The intrapleural pressure is reduced and the vital capacity immediately increased in consequence. In emergencies open wounds should be covered with heavy dressings to minimize respiratory distress and fatigue while facilities for surgical closure are being prepared. Recurrence of dyspnea usually indicates that either blood or air is entering the pleural cavity. The management then is similar to that of non-penetrating wounds.

Penetration by small missiles or by the jagged ends of fractured ribs may create hemothorax or pneumothorax in the absence of a patent wound extending from skin surface through the pleura. Frequently the resultant closed pneumothorax is of the dangerous valvular or tension variety characterized by positive intrapleural pressures and increasing respiratory and circulatory distress. Prompt recognition of these conditions is imperative—it usually must be based upon the clinical picture since roentgenological facilities and instruments for the measurement of pleural pressure are seldom immediately at hand. Deviation of the trachea and apex beat away from the side of the pleural accumulation and diminished breath sounds over the involved hemithorax are the most important signs of traumatic hemopneumothorax. The increasing intrapleural pressure diminishes the vital capacity and venous return to the heart, the latter action augmenting the effects of trauma and blood loss in producing shock. Emergency treatment consists in the aspiration of blood or air if required by symptoms of respiratory embarrassment. The usual measures employed in combating shock are also applicable with one notable exception, namely that the patient with markedly elevated intrathoracic pressure will seldom tolerate the supine position and must be placed in a semi-sitting posture to minimize the dyspnea. After transportation to the hospital the pressure manometer furnishes a helpful guide to further management. If a large hemorrhage into the pleural space has

occurred, aspiration becomes necessary to relieve the distress occasioned by the pressure. The removal of the blood reduces the pressure and alleviates the associated symptoms, but too marked a lowering of the pressure may promote further hemorrhage. In most cases a satisfactory solution of this dilemma consists in aspiration of the blood and replacement with sufficient air to maintain the mean intrapleural pressure at an atmospheric level. In relief of tension pneumothorax, it is not advisable to reduce the intrapleural pressure much below the atmospheric pressure because a vacuum tends to reopen the wound in the visceral pleura. Should positive pressures keep building up in the pleural cavity after several aspirations a catheter must be inserted to provide continuous relief.

Crushing injuries of the chest may produce emphysema of the interstitial tissues and mediastinum. This may be the result of the rupture of an alveolus or even of a tear of a major bronchus. The investigations of Nissen (37) and Francis and Ballou (4) indicate that the first effect of increased intramediastinal pressure is compression of the great veins. The syndrome of cardiac tamponade characterized by a marked fall in the systolic blood pressure, a rise in the venous pressure and muffling of the heart sounds, may ensue if the pressure elevation is sufficiently great. Several pathways of escape usually prevent the building up of high intramediastinal tension, however. The air may ascend to the neck, descend into the retroperitoneal fascia, or dissect extra-pleurally anteriorly and posteriorly. Recognition of traumatic mediastinal emphysema depends chiefly upon the notation of subcutaneous crepitation occurring in the episternal notch and spreading laterward and on the roentgen demonstration of air within the mediastinum. A curious popping or crunching sound synchronous with cardiac systole has been described (9) and has been audible in several cases of mediastinal emphysema observed by the authors. Skin incisions in the episternal notch with application of the suction apparatus have been advocated for relief of intramediastinal tension, but it appears probable that spontaneous recovery ensues when alveolar rupture is responsible for the emphysema and that fatalities occur regardless of such treatment when a major bronchus has been ruptured.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Deady W E. Removal of the Longitudinal Sinus Involved in Tumors. *Arch. Surg.* 90, 4 44.

Occasionally dural meningiomas invade the longitudinal sinus. In these cases, unless the affected part of the longitudinal sinus is resected there is no possibility of curing the tumors. The tumors may be unilateral or bilateral. They frequently occlude the longitudinal sinus either by compression or invasion, so that removal of a section of the longitudinal sinus affects the demand for collateral venous circulation

very little or not at all. In these cases the venous obstruction has doubtless been gradually progressive, and there has been time for the collateral circulation to develop. It is not known whether patent sinuses can be resected.

The author reports on 9 cases from the literature and 4 cases of his own. The operation in all of the cases except 2 was successful, and there were no post-operative disturbances attributable to the resection of the sinus.

Clinically the most constant features are head ache with g on the head and convulsions.

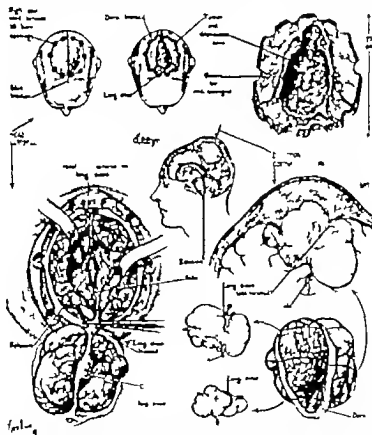


Fig. Operative sketch showing the bone removed, the excision of the by perosteal bone, the position and character of the tumor and the effect on the longitudinal sinus. The operative removal of the tumor and the longitudinal sinus is shown in the larger sketch on the left.

There may be additional symptoms which depend upon the location of the tumor. The x rays show hyperostosis. The operation is described.

DAVID J. IMPASTATO, M.D.

Keith, Sir A. Concerning the Origin and Nature of Certain Malformations of the Face, Head, and Foot. *Brit J Surg*, 1940, 28, 173.

For more than thirty years the author has been interested in a satisfactory explanation of congenital malformations, especially congenital buccal grooves and creases. In a well written and generously illustrated article, many arguments are given which seem to present ample proof for the conclusions offered.

As the first evidence that the explanation lies in a temporary or permanent breakdown in the circulatory system of the fetus, Keith reviews in some detail the embryological research of George L. Streeter. Microscopic sections of fetal constricting bands, such as lead to intra-uterine amputation, show that the base of the cord appears to issue from the deep fascia and passes through the epidermis. Circumstantial evidence points to the end of the second month of development as the period at which the toes and fingers, the most common sites of this disorder, are just assuming their discrete shapes.

In nearly all of Streeter's cases examination of the placenta and umbilical cord revealed evidence of defect and circulatory failure. At the end of the second month the placenta is undergoing rapid expansion and is therefore in its most vulnerable phase of growth. Circulatory disturbance in the fetus results in a fibrous outgrowth, such as a cord or a band, because the skin and fascia fibroblasts respond in a particularly vigorous manner when deprived of their blood supply. Cardiac circulation is not fully established until toward the end of the second month, and the amniotic fluid provides a particularly favorable tissue-culture medium. Thus at these sites of tissue, injuring cords or "amniotic bands" form, a process which the author terms "Streeter's Fetal Dysplasia."

Illustrations and conclusions from the researches of Ellen B. Finley are reviewed, they offer proof that the fetal scalp is not invaded by new vessels sprouting from the old but that the scalp mesenchyme just in advance of the growing margin becomes transformed into red blood cells and vascular endothelium. Thus if during this process a partial or temporary breakdown occurs in the placental circulation the chief damage would be at the growing margin of vascularization, which would result in a where along the extremities as well as on the scalp, because at the end of the second month of development the distal parts of the human extremities are still in the capillary stage of vascularization. As further evidence that congenital scars, defects of the scalp, meningoceles, spina bifida, and the various degrees of anencephaly are probably the result of circulatory failure, which may be placental

in origin, the author cites the embryological research of H. W. Ingalls. He also calls attention to the fact that the dysplasia may involve an irregular area of dermal and subdermal tissues as well as the linear form as seen in the digital bands.

The various forms of dysplastic lesions of the face, including buccal grooves and creases, median cleft of the lower lip and mandible, oral temporal cleft, fissure from lip to eyelid, band from tongue to palate, and the more extreme fetal defects such as anencephaly are then discussed and well illustrated. Again the conclusion is drawn that all such lesions are caused by a local necrosis probably due to a circulatory failure which may be placental in origin. These lesions become manifest at two stages of human development, both toward the end of the first and toward the end of the second month. Amniotic adhesions are shown to be always produced by and from the fetus and never by a failure in the separation of the amnion from the embryo. Thus they are the result and not the cause of fetal malformations.

The experiments of H. J. Bagg, who by small doses of x-ray damaged the parent germ-plasm and produced a strain of mice which were particularly liable to dysplastic lesions of the feet, convinced the author that club foot in all its human forms is but one of the many ways in which Streeter's dysplasia becomes manifest in our fetal bodies.

LOUIS T. BLAIRS, M.D.

EYE

Souders, B. F. Transcranial Extirpation of a Fibro-hemangioma of the Orbit, Report of a Case. *Arch Ophth*, 1940, 24, 539.

"Hemangioma of the orbit is considered by Benedict and Love, Reese and others to be the most common type of primary intraorbital tumor. The typical case is one in which slowly developing but variable unilateral exophthalmos occurs, usually in the first or second decade of life. Exophthalmos is usually 'straight forward,' and the degree of exophthalmos may increase with dependent posture of the head or with compression of the jugular vein. It is not usually pulsatile, nor is a bruit commonly heard. Vision is not significantly affected unless the tumor becomes large or is situated within the muscle cone. Limitation of ocular rotations seldom occurs. A portion of the cavernous type of angioma is sometimes present in the lid or conjunctival sac, but the fibrous type, which is usually located in the posterior portion of the orbit, may give no external evidence of its nature."

"Unilateral exophthalmos is frequently the only symptom presented by the patient with a vascular tumor of the orbit. Its presence indicates the need for exhaustive study to exclude exophthalmos of extraorbital origin. If one suspects a primary tumor to exist in the orbit, hemangioma should be among the first possibilities to consider in the differential diagnosis. Rapid regression of exophthalmos of

Irradiation may confirm the diagnosis, since this type of tumor is quite radiosensitive. It must be admitted, however, that careful study of many cases of unilateral exophthalmos frequently fails to establish preoperative pathologic diagnosis or even an exact anatomic location of the lesion.

The uncertainty of the position and nature of the growth makes the choice of operation difficult if operation is decided on. The orbital approach, as outlined by Elschnig, may be directed through the conjunctiva, through the skin of the lid or through an opening created by an osteoplastic flap of the malar bone—the Kronlein procedure. Exenteration of the orbit, of course, constitutes another operative measure. The usual approaches are satisfactory for tumors in the anterior aspect of the orbit. They frequently prove inadequate, however, when removal of a tumor from the posterior portion of the orbit is attempted. Unnecessary trauma to vital orbital structures may result, or the tumor may be incompletely removed, a fact of serious importance if intracranial extension has taken place. It must also be remembered that copious hemorrhage which occurs commonly in the removal of highly vascularized tumors, may be extremely difficult to control.

The inadequacy of the usual methods of approach to the orbit has led to consideration of transcranial procedure. Benedict and Adson in 1934 reported a case in which transfrontal craniotomy was done with unroofing of the orbit to effect the removal of an intraorbital tumor. Aufferer previously hinted at the feasibility of the operation in his description of orbital decompression for malignant exophthalmos. Dandy in 1939 reported some what similar procedure for the treatment of intracranial tumors of the optic nerve. The approach is obviously neurosurgical, but it does not possess the gravity of the usual craniotomy since it is entirely extradural. The procedure permits satisfactory exploration of the orbit and contiguous cranial cavity and offers accessibility to tumors in these areas.

The case reported here represents one in which a retrobulbar orbital neoplasm was suspected. A transcranial surgical approach to the orbit as made which permitted successful, complete removal of an encapsulated fibrohemangioma of the posterior orbit.

LAWRENCE L. MCCOY, M.D.

Savin, L. H., and Tyrrell, T. M. A Preliminary Note on the Use of Retrobulbar Proctocaine Anesthesia for the Relief of Intractable Ocular Pain. *Brit J Ophth* 1940, 24, 350.

Savin and Tyrrell of London report that relief from prolonged and severe pain in an eye retaining useful vision is often difficult. Ophthalmic pain can sometimes be bearable, especially in elderly patients. Measures such as the application of heat, the use of leeches, and sedatives are often ineffective. Anesthesia by means of the retrobulbar injection of procaine solution though effective affords only transitory relief.

Since January 1940 they have been experimenting with intractable cases with the retrobulbar injection of "proctocaine" and have acquired enough data for preliminary report of best promises to be a valuable therapeutic procedure.

Retrobulbar injections of proctocaine were performed for 8 painful eyes. In 11 cases the pain was completely relieved, and in 5 cases it was partially relieved. There were 2 failures, one due to faulty injection, the other was unexplained.

Corneal sensibility was carefully tested both before and after the injections. Usually the sensitivity was lowered, but it was never completely absent after the injection. The authors believe that particular care should be taken when retrobulbar injections are given in cases in which the corneal sensibility is lowered. They have seen no neuro-paralytic keratitis after these injections, but they believe that the patients should be kept under observation.

The cases of diplopia following proctocaine injection both cleared rapidly. Their occurrence did not surprise them, as sector of the sphincter ani is often temporarily paralyzed when an anal fissure is injected with proctocaine. In both cases the injection was given rather far back inside of the muscle cone. Patients with good vision in painful eye should be warned of the possibility of temporary diplopia before the injection is given. Fortunately an intolerably painful eye usually has reduced vision, so that diplopia would not be noticed in such cases.

None of the authors' patients showed any sign of toxic symptoms following the injection. Proctologists sometimes use from 20 to 30 c.c.m. locally.

Comparatively small amounts of the proctocaine have so far been employed because of doubt as to whether the almond oil could be absorbed from the orbit. In 1 case some of the oil came forward subconjunctivally. In one case it disappeared in a few days, in the other it remained on view for three weeks. It is generally supposed that the vegetable oils become emulsified after injection into the body and are gradually absorbed. Pending corneal information the authors have so far deemed it wise to try a second injection when the first was not entirely successful. Experimental work on the absorption of oil would be helpful.

Proctocaine was employed because it is the only preparation readily obtainable on the market for prolonged anesthesia. The proportions of the ingredients are originally planned for effective rectal and anal anesthesia only. Modifications of the constituents might quite probably give better solution for orbital use. Further research would seem indicated.

If proctocaine is employed for the relief of pain in blind eye, all possibility of neoplasm should be excluded. Proctocaine retrobulbar injections can be safely recommended for painful eyes with full corneal sensibility and poor vision. If vision is good in painful eye the possibility of producing temporary diplopia by the injection must be remembered.

Neuroparalytic keratitis is a theoretical possibility if corneal sensitivity is unduly lowered, but so far this complication has not been encountered in practice

LESLIE L. MCCOY, M D

Terry, T L, and Chisholm, J F, Jr. Studies on Keratoconus Relative to the Effect of the Prolonged Application of Pressure *Am J Ophth*, 1940, 23 1089

The authors state that from their studies of keratoconus and their successful experience in applying pressure to cure the corneal deformity, the following facts should be stressed and the following conclusions drawn

Thinness in the central area of the cornea appears in the embryo and persists through life, it represents a physiological keratoconus

The tensile strength of the cornea depends primarily on the white fibers of the substantia propria and the forces binding them together. Secondly, elastic fibers lend strength when the cornea is distended

If elastic tissue is an important constituent of the cornea, conditions causing elastic tissue degeneration, such as stria gravidarum, pseudoxanthoma elasticum, pinguecular formation, and even the elaboration of relaxin during pregnancy, may be of some etiological importance in keratoconus

The greater number of lamellæ at the periphery strengthens the cornea here

A hereditary weakness of the cornea need not manifest itself until puberty or early adult life when the eye is subjected to its greatest pressure—except during parturition—perhaps, because of the stresses of life

The possible value of pressure treatment in progressive myopia and other scleral ectasias should be investigated

1 The essential pathological process of keratoconus has not been observed since all the pathological material studied represented late stages of the disease complications and often it was not seen until after surgical treatment had altered the picture

2 As no lamellæ extend over the entire cornea, any overdistention sufficient to disrupt the connection and adhesion of the lamellæ would cause a slipping of the layers and thus produce an ectasia of the cornea

3 As determined from testing the tensile strength of corneal strips, the rabbit cornea should rupture at an internal pressure of 697 mm of mercury

4 The fact that small degrees of keratoconus are relatively frequent is observable upon painstaking examination of many patients with over 3 diopters of astigmatism especially if one meridian of the error of refraction is myopic

5 The development of keratoconus lacks sufficient irritation to stimulate scar-tissue formation until late in the growth of the deformity

6 Pressure treatment, the full value of which has hitherto been unrealized, reduces the deformity in some instances and gives permanent cure of the dis-

ease if the pressure is maintained sufficiently long (at least ten weeks) to allow the scar-tissue repair to mature enough to hold the newly attained more or less normal thickness of the cornea

7 The eye rotates freely under the pressure bandage

8 The cure of the corneal deformity may arise (a) through irritation and a reaction of fibrous-tissue growth brought on by almost continuous change in the pattern of folds and wrinkles of the cornea under compression incident to rotation of the eye, and (b) through the normal tendency of the cornea and sclera to contract and thicken when intra-ocular pressure is lowered indirectly by greatly elevating the extra-ocular pressure with the pressure bandage

9 Complications of variable importance commonly encountered in pressure treatment are corneal scar (in all cases), ciliary injection, and spastic miosis during the period of treatment, vascularization of the cornea, and erosion of the cornea

10 Since the pressure bandage is to be used for ten weeks, it must be applied more carefully than usual to avoid skin irritation and chafing of the forehead and ears

11 Pressure treatment at the present time should be limited to patients who have keratoconus of considerable amount with reduced visual acuity not improved materially by contact glasses

LESLIE L. MCCOY, M D

Sorsby, A. The Dystrophies of the Macula *Brit J Ophth*, 1940, 24 469

In this article the author concludes that macular dystrophy presents such a protean range of manifestations that the classification suggested by Behr, helpful as it has been, must be regarded as distinctly schematic. The range of ophthalmoscopic appearances extends from faint mottling of the macular zone to the picture seen in Doyne's choroiditis, almost every possible intermediate lesion having been reported. The conception of a distinctly isolated macular lesion is not valid. There may be present not only extensive perimacular involvement but also peripheral lesions, and some general involvement of the whole fundus is not excessively rare. One case is reported showing the association of macular dystrophy with typical retinitis pigmentosa. A rigid classification of the macular dystrophies on a chronological basis involving distinct age groups, as postulated by Behr, is not borne out by experience. The age of incidence extends, just as the ophthalmoscopic appearances, over a continuous unbroken range.

The apparent complexity of abiotrophic central lesions of the fundus lends itself to considerable simplification. Three clear cut types are recognizable (1) Central choroidal sclerosis as shown in a previous article. Here the primary lesion develops in the vascular bed of the choroid

(2) Angioid streaks—which must now be regarded as part of the generalized process of elastosis dystrophica—produced by ruptures in the membrane of Bruch and followed by secondary changes

(3) Central retinal dystrophy theoretically the central retinal dystrophies might show several sub-varieties (a) neuro-epithelial types, in one the rods being involved, in the other the cones and type dependent upon changes in the retinal capillaries supplying the central area. On the present material, because of the almost total lack of histological information, this fine subdivision is impossible.

SUMMARY

1. Eight familial groups of macular dystrophy are reported.

They illustrate the great range of ophthalmoscopic appearances, extending from fine mottling of the macula to "exudative reactions," "inverse retinitis pigmentosa," intense central pigmentary changes, hole formation, extensive perimacular involvement and the patterned reaction of Doyne choroiditis.

3. Symptomatically macular dystrophy has equally wide range. The symptoms may be so severe as to constitute total day blindness (total color blindness) or so mild that vision is hardly affected. The condition is not necessarily rapidly and relentlessly progressive.

4. On the basis of these cases, supported by an analysis of the material recorded in the literature it is held that Bert's congenital macular degeneration, Doyne's choroiditis, Stargard's disease and the numerous types of central macular dystrophy described by different observers constitute single clinical entity with more than one mode of inheritance.

5. This central retinal dystrophy must be distinguished from central internal limiting membrane dystrophy (angiod streaks).

LESLIE L. MCCOY, M.D.

Puntenney, L.: The Effect of Stimuli on the Caliber of the Retinal Blood Vessels. *Am. J. Ophth.* 1919, 3, 3.

In this article the author presents (1) discussion of methods for photographing the retinal blood vessels in man, (2) description of the K. Ka. ophthalmodynamometer which has been used experimentally for lowering the intra-ocular tension, and (3) new photographic evidence with the following findings:

The inhalation of amyl nitrite produced dilatation of the veins in 6 of 8 patients and slight dilatation of the arteries in 5.

1. Intra-ocular pressure reduced with the K. Ka. apparatus produced an increase in the caliber of the veins in 8 of 8 patients with slight increase in the caliber of the arteries in 3.

3. Injections of methobol produced dilatation of the veins in 3 of 8 patients with questionable dilatation of the arteries in 1.

4. An increase in the caliber of the vessels was observed after nembural and coldpressor tests.

5. One patient photographed during hyperpyrexia treatment showed a questionable dilatation of the veins.

The value of exteptoecopy in determining focal narrowing of the capillaries is too discussed by the author. He recommends the Kuka ophthalmodynamometer for massage during treatment following occlusion of the central artery.

LESLIE L. MCCOY, M.D.

EAR

Mitchell, H. E.: Tumors of the External Auditory Canal, with Report of 11 Cases. *Arch. Otolaryng.* 1919, 3, 83.

The author reviews 11 cases of tumor of the external auditory canal from Cleveland City Hospital and Lakeside Hospital. In this series, there were only 3 cases of malignant tumor. 11 of these the lesion was squamous carcinoma. 1 patient was white woman, a Negro and the other 10 white men.

Ten cases of pathologically benign but locally recurrent tumor are perhaps the most interesting from the clinical point of view. One tumor was of cylindroma type, lymphangioma, in a Negro woman. No other case of this type has ever been reported in the literature. The other tumor was persistent keloid formation which blocked the external auditory canal. The patient in this case also was a Negro woman.

One case of benign ulcer resembling malignant lesion is described.

Five cases of otosclerosis also are included.

The recent literature on tumors of the external auditory canal is reviewed.

JAMES C. BAER, M.D.

MOUTH

Mead, B. V.: The Control of Hemorrhage. *Am. J. Orthodont. & Oral Surg.* 1919, 16, 921.

The causes of hemorrhage are trauma, surgical operations, irritation by foreign bodies and loose bone, sepsis, periodontal disease, invasion of malignant growths as well as certain constitutional disorders. The types of hemorrhage which are likely to prove most troublesome after operation occur in hemophiliacs, or congenital bleeders, in patients who have lowered resistance from infection and diseases of the blood, and persons having high blood pressure. According to the vessel involved, hemorrhage may be arterial, venous, or capillary.

Classified according to time, primary hemorrhage is one which occurs at the time of injury, an intermediate hemorrhage, one which occurs within twenty-four hours after the cessation of the primary hemorrhage, and secondary hemorrhage is one which occurs after twenty-four hours.

Classified according to cause are numerous factors: trauma, ulceration of the vessels, changes in the composition of the blood or elements of the blood, polycythemia, granulocytosis, pernicious anemia, aplastic anemia, lymphatic and myelogenous leukemia, purpura hemorrhagica, secondary anemia, and hemophilia. In arterial hemorrhage the blood escapes in spurts

and is of a bright red color, in venous hemorrhage the blood is dark and flows steadily, and in capillary hemorrhage there is a general oozing of blood from the surface

When hemorrhage arises as a difficult problem, a very careful clinical examination should be made, supplemented by a general physical examination and laboratory tests, when necessary, in order to make a correct differential diagnosis. In cases in which there is a systemic disorder, it is desirable to correct any abnormality before surgery. If the bleeding or clotting time is at all abnormally high, an attempt should be made to correct this before surgery. When the patient gives a history of previous bleeding, careful attention to diagnosis and prevention should be carried out. Very little dependence should be placed upon the usual types of remedies, such as calcium lactate, calcium gluconate, gelatin, and many of the proprietary preparations. Compound tannic-acid solution is the best agent for local use in the mouth. There seems to be much merit in the use of citrus fruit and juice to provide Vitamin P, with which to correct capillary fragility. Vitamin K is beneficial in cases of biliary deficiencies and in hemorrhagic diseases of the newborn. Koagmin, too, has proved beneficial. The one great method upon which all surgeons depend is transfusion. This is usually a postoperative measure, but in extreme cases may be used as a pre-operative measure.

NOAH D. TABRICANT, M.D.

NECK

Albright, H. L. Severe Hemorrhage from the Head and Neck. *New England J. Med.*, 1940, 223, 532

In the majority of even severe hemorrhages, adequate control may be gained by the use of a hemostat, ligature, pressure, or packing. Occasionally additional measures may become urgently necessary in order to control hemorrhage from intra oral cancer and deep lacerations of the head and neck, especially stab and bullet wounds.

Although in many cases massive hemorrhage from the mouth may rapidly become fatal, methods of quick, orderly approach, such as immediate intra-oral and extra-oral manual pressure, tracheotomy followed by gauze packing of the pharynx and, later, by proximal ligation of the affected vessel, may help in controlling the emergency and in eventually saving the patient's life. Likewise, deep lacerations, such as stab and bullet wounds may require any or all these measures to control the hemorrhage.

Injury in the region of the retroparotid space is very likely to sever the last four cranial nerves—glossopharyngeal, vagus, spinal accessory, and hypoglossal—and the cervical sympathetic trunk. This gives rise to characteristic changes described by Villaret in 1917 as the syndrome of the retroparotid space.

The characteristics of this syndrome are easily recognizable, seriously damaging, and usually permanent. They are summarized as follows:

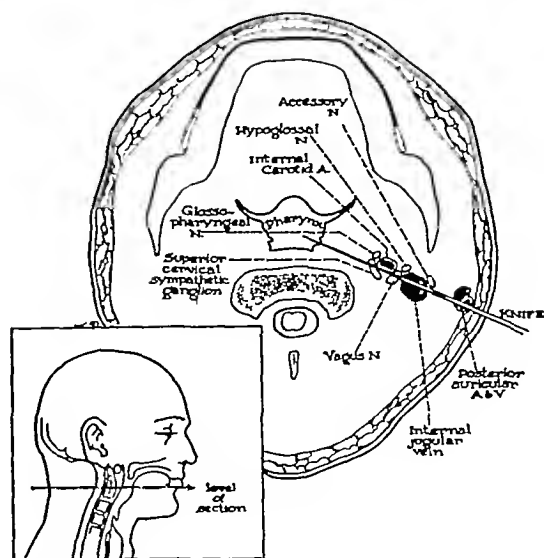


Fig. 1. This sketch shows the level of injury (insert) and a cross section study. The path of the knife blade traverses the retroparotid space. Note the closeness of the uninjured internal carotid artery to the other structures severed, namely, the posterior auricular artery and vein, internal jugular vein, last four cranial nerves, and cervical sympathetic ganglion.

TABLE I—POSSIBLE RESULTS OF NERVE INJURY IN THE RETROPAROTID SPACE

Results	Nerve involved
Loss of taste on posterior third of tongue	
Deviation of dorsal wall of pharynx to sound side	Glossopharyngeal (ninth cranial) nerve
Loss of sensation in pharynx, palate and fauces	
Loss of sensation on dorsal wall of external auditory meatus of ear	
Paralysis of vocal cord and palate on side of injury, with hoarseness and dysphonia	Superior laryngeal or inferior recurrent laryngeal (vagus—tenth cranial) nerve
Difficulty in swallowing and eating, with regurgitation of fluids into nasopharynx	
Inability to raise arm due to paralysis of trapezius muscle, causing a winged scapula deformity	Spinal accessory (eleventh cranial) nerve
Paralysis and atrophy of one side of tongue, with deviation to the injured side	Hypoglossal (twelfth cranial) nerve
Enophthalmos, narrowing of palpebral fissure, miosis and numbness of side of face—Horner's syndrome on side of injury	Cervical sympathetic nerve trunk

Control of such massive hemorrhage and recognition of those extracranial nerve injuries are illustrated in the case operated on by the author. The

patient as man who was severely stabbed with flat-bladed knife in the upper right posterior side of the neck. Profuse hemorrhage as first controlled by pressure then by three deep silk sutures through skin and subcutaneous tissues. Secondary hemorrhage occurred the next day following coughing. Examination confirmed the suspicion that the posterior pharyngeal wall had been pierced just above the level of the soft palate. There was paralysis of the right vocal cord and low husky pitch to the voice with thickened speech difficulty in swallowing and nasal regurgitation. Operation was carried out under novocaine anesthesia. After removal of the clot generous enlargement of the incision, and retraction of the deep fascial layers, exploration revealed extensive deep tissue injury undoubtedly reaching the pharynx. The terrific bleeding defied exposure and control, so the wound was tightly packed. The patient was turned on his left side, and under novocaine infiltration 5-cm. incision was made along the anterior border of the right sternomastoid muscle in the upper third of the neck. The bifurcation of the common carotid artery was clearly exposed and the external carotid artery was doubly ligated with No. 1 chromic catgut above and below its first branch, the superior thyroid artery hereby the possibility of collateral blood flow from the opposite side of the neck was cut off. The wound was closed in layers. The original wound was then inspected after removal of the gauze pack, and hemorrhage reappeared, although with less force. It appeared to be coming from the internal jugular vein at the base of the skull, the bleeding from the posterior auricular and occipital arteries was probably removed. The wound was tightly repacked. The patient recovered.

Seven weeks later the patient was well except for difficulty in swallowing, with the food threatening to go down the trachea. There was hoarseness with lowered pitch of the voice, and almost daily morning headaches. In addition he presented a right Horner's syndrome and weakness of the entire right side of the face.

Eleven months later by which time the theoretical of the literature had drawn his attention to Villaret's syndrome of the retropharyngeal space, the patient was seen again and noted to have all the evidences of complete extracranial division of the glossopharyngeal, vagus, spinal accessory and hypoglossal nerves, and partial recovery from injury to the sympathetic nerves.

In this case ligation of the external carotid artery diminished but did not in any manner control the hemorrhage. The persistent non-arterial bleeding suggested severance of the internal jugular vein at level close to the base of the skull, just below its emergence from the jugular foramen. The sketch (Figure 1) allows clear visualization of the path of the flat-bladed knife through the deep retropharyngeal space to the nasopharynx.

The author suggests that ligation of the internal carotid artery should be done only when it is urgently

necessary for complications occur. The artery's most cases should be ligated just distally to its first branch, the superior thyroid artery in order to prevent thrombosis from extending to the internal carotid artery and to eliminate collateral blood flow from the opposite side in the superior thyroid artery.

SAMUEL H. KLEIN, M.D.

Sargauer M. Malignant Goiter (Die Struma maligna). Monatschr f Krebsheilk 910, 3

7

Eighty per cent of malignant strumas develop from nodular goiter. The frequency of malignant goiters is greater in endemic regions than in regions where the goiter develops only sporadically. The so-called cystadenoma papilliferum is independent of the thyroid gland and originates from germinal tissue of branchial clefts.

Various types of malignant goiter have for their aetiological signs: (1) rapid growth, (2) increased consistency, (3) diminished mobility on palpation or deglutition, and (4) tubercles on the trachea radiating to the shoulders or occipital region are suspicious. While an involvement of the recurrent nerve leading to hoarseness and paralysis of the sympathetic nerve (the Horner signs) are rarely significant. The general condition is not necessarily affected in early stages of functional disturbances of the thyroid gland are exceptional. As a rule metastases appear only in advanced stages but recent gangrenas of the lungs are always drivable. It is important to differentiate malignant goiter from an old hemorrhagic cyst which may simulate neoplastic disease. A diminishing size of the tumefaction speaks in favor of hemorrhage. Thyroiditis, strumitis, tuberculous suppuration, tuberculosis and phyllitis may complicate the picture.

The best method of treatment is surgical, followed by irradiation. The author is opposed to extended radium and ray treatment. The internal jugular vein may be sacrificed on one side if necessary, but in adults the carotid artery should not be ligated. Two containers, each 100 cc. of 20 mgm of radium and with 1 mm platinum filter wrapped in rubber, are placed into the wound for 2 days. Six weeks later from 4 to 60 mgm of radium are placed over the involved region at a distance of 3 cm. from the skin for from 10 to 16 days.

The average life expectancy is 3.77 years if proliferating struma is present the figures are 4 years for the endothelial type, 3 years for carcinoma and 85 years for sarcoma.

(Eccentric) JONES K. N. M.D.

Postema, G. Total Laryngectomy in Three Stages (La laryngectomie totale en trois temps). French Med. Par. 940, 45 633.

Total laryngectomy is the only effective operation in cancer of the larynx. The mortality of this operation has been very high because of postoperative lung complications. Gangrene of the operative wound often occurred on the fifth or sixth day after

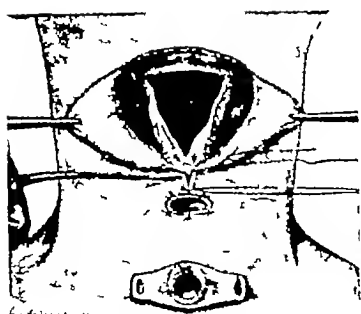


Fig 1

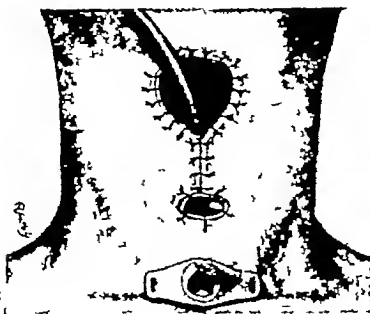


Fig 2

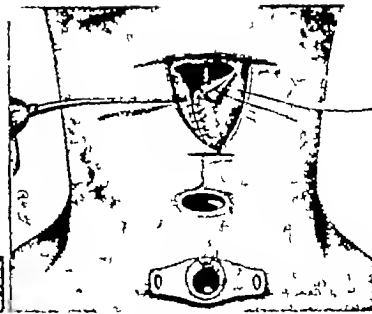


Fig 3

Fig 1 The larynx has been removed and the upper end of the trachea sutured to the skin

Fig 2 The mucous membrane of the pharynx has been sutured to the skin, the feeding tube is passed through the opening, and a dressing separates this wound completely

from the tracheotomy opening below

Fig 3 A plastic operation is performed, after the feeding tube has been removed and passed through the nose. The mucous membrane is sutured with catgut and the skin with horsehair

operation and this was followed a few days later by pneumonia

The author tried various methods of avoiding this complication without success until he finally devised a method of operation which prevented the lung complication. He isolated the respiratory opening in the trachea from the operative wound through which the larynx was removed. The first stage of the operation is the performance of a tracheotomy just above the end of the sternum. The interval of two weeks between this and the laryngectomy permits of healing of the tracheotomy wound and the establishment of regular respiration through the tracheotomy so that the lungs are less vulnerable when the main operation is performed. The second or main stage of the operation is the total removal of the larynx through a pharyngostomy opening. Hemostasis is assured by suture of all the vessels that might bleed secondarily. Then the mucous membrane of the upper end of the trachea and that of the pharynx is sutured to the skin. The feeding tube is passed through the pharyngostomy opening and a heavy

dressing placed over this wound so that the tracheotomy opening through which the patient breathes is separated by a considerable stretch of normal skin from the upper opening into the digestive tract. Some two months later a plastic operation is performed for the closing of the pharyngostomy. The tracheotomy opening frequently closes spontaneously, if it does not it can be closed by a plastic operation also.

The advantages of the operation are (1) it prevents infection of the respiratory tract from the laryngectomy wound, (2) the operation is much shorter than the old one, as it can be performed in forty-five minutes instead of from an hour and three-quarters to two hours, (3) the patient is less shocked because of the brevity of the operation and the minimum of toxic absorption. The patient can generally be out of bed in two or three days. In the 34 cases that have been operated on in this way in the six years since the introduction of the method there has been no operative mortality.

AUDREY G. MORGAN, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Thorner, M. W., Field, R., and Levy, F. H. The Effects of Repeated Anoxia on the Brain. *J Am Med Ass* 1940, 5 595

This study of the effects of repeated anoxia on the brain is particularly timely because of the repeated anoxia suffered by aviators at high altitude, and with this in mind it was undertaken at Randolph Field, Texas. The object was to determine the histological changes in the brain following specific periods of anoxia. The animals used were guinea pigs and cats. They were placed in glass containers so that they could be observed during the period of anoxia and the anoxia was produced by immersion in nitrogen. The usual objection that the circulation was impaired during the anoxic period was avoided in this series of experiments. The animals were placed in five groups.

Group 1. Animals rendered anoxic for various periods of time and decapitated within one-half hour of removal from the chamber.

Group 2. Animals killed in nitrogen directly with no recovery period.

Group 3. Animals killed in nitrogen following repeated sublethal exposures on different days.

Group 4. Animals dying hours after nitrogen immersion.

Group 5. Animals decapitated after repeated anoxia.

From the experiments the author concludes that exposure to sublethal periods of anoxia led to vascular and degenerative changes in the brains of guinea pigs and cats. Some of these changes were irreversible and became summated in animals repeatedly subjected to anoxia.



Fig. 1. Section of fascia dentata of Ammon's horn of the animal decapitated after having been immersed in nitrogen for sixteen seconds, showing normal architecture and appearance of cells. (Cresyl violet stain reduced from photomicrograph with magnification of 350 diameters.)



Fig. 2. Section of fascia dentata of Ammon's horn of the animal that died forty-eight hours after the last of twenty-four exposures to nitrogen, showing ischemic cell necrosis. (Cresyl violet stain reduced from photomicrograph with magnification of 350 diameters.)

These results cannot be directly correlated with anoxia in man, but inferences may be drawn. At the same time the experiments suggest that individuals exposed repeatedly to low oxygen tension will have a gradual lowering of cerebral reserve and may eventually develop a condition similar to that of the punch-drunk boxer. Illustrations of the degenerative changes in the brain as revealed by the microscope are provided.

ADRIAN VANZANTOVICH, M.D.

Koskoff, Y. D., Markson, Y. and W. H. N. M. A Method for the Removal of Areas of Brain Following Freezing in Situ. *Am J Surg* 1940, 50 57

An ingenious double-cylinder apparatus to be used with liquid nitrogen is described as a means of removing cortical blocks after freezing in situ. It has been used experimentally on cats in which the authors found that clean sections could be made with minimum of hemorrhage and trauma. The method is described for experimental use but it indicates that the instrument may be adaptable to certain uses in neurological surgery on the human brain, as in the removal of tumors.

JOHN MARTIN, M.D.

Raney, R. B., and Raney, A. A. Trigeminal Neuralgia with Demonstrable Gross Cerebral Lesions. Report of 5 Cases. *Am J Surg* 1940, 50 7

It is agreed by the authors that it is frequent unwise to section the posterior root of the trigeminal nerve when trigeminal pain is not typically that of true major trigeminal neuralgia. With the classical type of pain, trigger zone and absence of other neurological signs. However they point out that although the trigger zone may be lacking in some of the typical neuralgias, the pain may be very much

the same as that of tic douloureux, and that definite organic cause for such pain can often be demonstrated and removed by surgery. They cite 5 such cases of their own, the findings were (1) adhesions about the ganglion and root following severe cranio-cerebral injury, (2) anomalous varix of the petrosal sinus, (3) calcified acoustic neurinoma, (4) chronic inflammatory process involving the dura, ganglion, and root, and (5) small, encapsulated acoustic neurinoma. The patient with the varix was freed of pain by coagulation of the vessels, and the removal of the small encapsulated acoustic neurinoma brought relief to the patient who was afflicted therewith, without sacrifice of the posterior root. In the 3 remaining cases, the root was sectioned and relief from the intractable pain was subsequently obtained in all three patients.

In such cases of atypical neuralgia in which surgery may be expected to offer relief, the distress usually follows the course of one or more branches of the nerve, and other neurological signs may be present. Likewise, there may be roentgenological evidence of a local lesion, or there may be a history of local trauma.

JOHN MARTIN, M.D.

SPINAL CORD AND ITS COVERINGS

Mixter, W. J., and Barr, J. S. *Protrusion of the Lower Lumbar Intervertebral Discs*. *New England J. Med.*, 1940, 223: 523.

Although the protrusion of an intervertebral disc may occur at any level, by far the most common site is either between L₄ and L₅ or L₅ and S₁. In such a location the rupture frequently occurs at the side of the vertebral canal and impinges on the fifth lumbar or the first sacral nerve root. The clinical entity will then be a constant one. Definite sciatic pain, diminution or loss of the Achilles reflex, difficulty in raising the straightened leg, and an elevation of the total protein content of the cerebrospinal fluid are the most common findings.

The authors believe that symptoms must be definite to warrant operation, and though they point out the disadvantages of lipiodol, they never hesitate to use it when a diagnosis is not certain after ordinary examination. They believe that preliminary orthopedic care should be tried and that "no patient should be investigated as a suspected case unless his symptoms have been severe and disabling and have persisted for months rather than weeks."

After accurate localization, they remove the protruding mass by rongeur away only the lower edge of the lamina above and the upper edge of the lamina below. Removal is always extradural, when possible, but the dura is always opened for the removal of lipiodol when such a substance has been used. Among 77 cases of verified protruded disc, followed up for more than one year, 80 per cent of the patients have been cured, results have been fair in 10 per cent of the patients, and the remaining 10 per cent were found to be unrelieved.

JOHN MARTIN, M.D.

PERIPHERAL NERVES

Nageotte, J. *Can We Improve the Treatment of Wounds of the Peripheral Nerves?* (Peut-on améliorer le traitement des blessures des nerfs périphériques?) *L'Union médicale du Canada*, 1940, 69: 1046.

In numerous experiments on animals, Nageotte has studied the function of nerve grafts and the types of graft that give the best results in injuries to the peripheral nerves. The graft he has found takes no part in the regeneration of the nerve except to serve as a framework for the advance of the regenerating nerve fibrils. The best type of tissue from the nature of its structure for this purpose is nerve tissue. This has been demonstrated in many animal experiments. An illustrative experiment is reported in which a section of 4 cm. was resected from both sciatic nerves of a dog, on one side the sciatic nerve of a rabbit fixed in alcohol was used as a graft to repair the defect, on the other side a portion of a vein fixed in formol was employed as a graft. The animal was killed a year later, but in the meantime it had regained the use of the hind legs on both sides. On the side of the nerve-tissue graft, the muscles of the leg were entirely normal in size and development, in the area of the graft the sciatic nerve was normal in structure except that it was smaller in diameter (the size of the sciatic nerve of a rabbit). On the side of the vascular graft, although the functional results had been satisfactory, the muscles were less well developed than on the other side, the area of nerve graft was irregular and the nerve fibrils did not show their normal regular arrangement and there was some abnormal fibrous tissue in the graft. During life the animal had shown signs of pain in three toes of the foot (trophic disturbances). From these findings the author concludes that in the repair of traumatic defects in peripheral nerves, nerve tissue should be used for the grafts. This nerve tissue may be taken from any species of animal, but it should have only a slight collagenous stroma.

The method of suture is also important in the repair of peripheral nerve injuries, it is not necessary to suture the graft tightly in place, it need only be held in contact with the nerve for the short period before the physiological processes of repair are established. Sutures should be placed at a few points only, and care should be taken not to injure the nerve fibrils. In his experiments on dogs the author has used only two suture points at each end of the graft, employing very fine silk passed through the nerve sheath, the knots are not tied tightly, just sufficiently to bring the surfaces into contact without pressure. Occasionally a third suture may be used if there is any tendency toward displacement of the graft. The graft should be sufficiently long so that no traction will be exerted on it in any position of the extremity involved. In about 150 dogs in which nerve graft operations had been done on both sides, there has been only one instance of disunion, and this was due to faulty technique. The author main-

tains that if the methods of nerve repair used in these experiments are applied in clinical practice they will improve the results obtained in peripheral nerve injuries.

ALICE M. MARVIN.

Kontsevoitzky A. S. Morphological Changes in Nerves of the Anterior Extremities in Laboratory Animals After Experimental Ischemia. *Izvestia Khir.* 1940, 50: 355.

Numerous physiologists emphasize the stability of nerves in the presence of a disturbed blood supply but such observations are not in accord with the morphological findings. Trophic lesions in animals after complete severing of the nerve trunks in the anterior extremities are rare. Clinical observations demonstrate the gravity of pathological processes in the lower extremities in man under the influence of prolonged disturbance of the peripheral circulation of the blood, while such sequelae are relatively rare in the upper extremities.

In 8 rabbits, 5 rats, and 7 frogs under ether anesthesia the thoracic cut the left subclavian artery between two ligatures, 0.5 cm. distal to the origin of the vertebral artery. A disturbance of the function of the involved extremity followed. The period of observation was fifteen days in the rabbits and rats, and from sixty to seventy five days in the frogs. No histopathological changes could be detected in the corresponding peripheral nerves in the rabbits and rats twenty four hours after the ligation of the artery. After from thirteen to fifteen days the nerve trunks of the rabbits' arms still remained intact but in the forearms signs of periaxial process appeared and several nerve fibers showed symp-

toms of alienian degeneration. Dilated blood vessels with intensely stained endothelial nuclei were visible in the perineural spaces. In some fibers myelin globules, deeply stained with osmic acid, were visible. In Nissl specimens the author found hypertrophied Schwann cells, with deeply stained nuclei and vacuoles in the protoplasm, while in the perineural spaces proliferation of fibroblasts noticed.

A similar pathological process with signs of degeneration but with more rapid evolution observed in the rats. All the changes were confined to the nerves of the forearm. The nerve trunks in a large number of nerve bundles were filled with granular cells. Not only was the cycle of evolution of degenerative changes accelerated in the rats as compared with the rabbit but also the stage of restitution was usually reached much earlier.

In specimens impregnated with silver no changes in the axial cylinders of the nerve fibers could be detected in the anterior extremities of the rats or rabbits. Intra vitam no motor sensory or trophic disturbances could be found.

A comparison of the author's findings in the anterior extremities of the animals with the findings of other authors in posterior extremities shows lesser intensity of pathological changes in the nerve parenchyma and the vasculoneurothymal apparatus in the front legs, although the character of the changes was identical.

A digital compression of the main artery supplying an extremity causes much less severe trauma of the peripheral nerves than the application of tourniquet.

JOSEPH K. NARA, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Adair, F. E. A Consideration of Recent Additions to Clinical and Experimental Knowledge of Breast Conditions *West J Surg, Obst & Gynec*, 1940, 48 645

The author states that he is not discussing problems relative to the breast on which there is general agreement but is considering those problems which today are leading to the greatest differences of opinion

In cases of maldevelopment of the breast in which the breasts develop unequally, surgery is definitely contraindicated. Periodic examinations should be made and if glandular therapy is used to hasten development, it is best to wait until the establishment of normal menstruation. Either subcutaneous injections of an estrogenic substance may then be used or, preferably, the local use of an ointment containing estrogenic substance may be resorted to.

Gynecomastia is not easily confused with carcinoma of the male breast but may be diagnosed when the true lesion is mastitis. The majority of cases of gynecomastia respond to treatment with testosterone propionate. Mastitis of the male breast is more common than cancer. Hot compresses and "scientific neglect" are the best treatment. The trouble usually subsides in several months.

Painful breasts in the female should not be treated by estrogenic substances first, because the painful breast is the fibrous or adenomatoid type not relieved by such injections, and second because the administration of large amounts of estrogenic substances increases, in all probability, the hazard of cancer development. Painful breasts are far more prevalent in thin women with no subcutaneous fat. Occasionally x-ray therapy will give relief to the patient with very large painful breasts. In the average case the cure is, first, reassurance, second, hot compresses or warm showers over the shoulder, breast, and chest wall of the affected side, and third, the acquiring of a thicker layer of adipose tissue.

Simple cysts and cystic disease do not include cysts containing papillomatous growth. The last usually develop in the years immediately preceding the menopause. In a series studied by the author, all occurred between the ages of thirty-seven and fifty-two years. Rarely does such a condition exist in the late twenties or early thirties. After a diagnosis has been established, one or two injections of from 10,000 to 15,000 international units of estrogenic substance greatly improve the condition for a month or several months. The author does not believe these cysts are precancerous.

The author discusses two lesions of the breast which he believes to be precancerous, the papillary cystadenoma and the localized hyperplastic or adenomatoid mastitis. The papillary cystadenoma is

localized to one duct beneath the edge of the areola. Pressure on the nodule produces a sanguineous or serosanguineous discharge from only one nipple. Here transillumination has its greatest value. The blood-filled cyst shows up as a dark shadow. Local excision is adequate if it is done carefully and properly.

A localized mass in hyperplastic or adenomatoid mastitis should be removed as it frequently becomes malignant after the menopause.

It is extremely rare for a fibro-adenoma to become a sarcoma of the breast.

After carefully discussing surgery of the breast and irradiation, the author states that as a result of work done in the past six years he does not use pre-operative radiation if there is no involvement of the axilla on the theory that surgery will probably produce a cure if anything will. However, those operable cases with axillary involvement are given heavy pre-operative irradiation because they are always desperate cases.

The indications for pre-operative irradiation in operable breast cancer are given as follows: (1) pregnancy, (2) young women in their twenties and thirties, (3) all cases with axillary involvement, (4) diffuse disease of the breast, such as comedocarcinoma or diffuse duct carcinoma, (5) all cases with multiple sites of cancer located in the same breast, (6) all cases with invasion of the skin of the breast or with skin nodules, and (7) inflammatory carcinoma located just in the center of the breast, otherwise inflammatory carcinoma is a totally inoperable disease.

The contraindications to pre-operative irradiation are: (1) colloid carcinoma, as it is completely radio-resistant, (2) the aged who do not well withstand daily trips to the hospital for irradiation, and (3) patients with cardiac disease to whom it is necessary to give intense irradiation directly over the cardiac area.

The unfortunate sequelae of pre-operative irradiation are: (1) with heavy irradiation above 1,800 roentgens per portal, the possibility of lung fibrosis, (2) coughing, (3) pain through the chest, (4) a swinging of the mediastinum and of the heart to the side radiated, (5) dyspnea, (6) anemia, (7) poor wound healing, (8) fibrosis of the muscles, tendons, and fasciae about the shoulder with marked restriction of motion, and (9) a much larger number of lymphedematous arms.

EARL O. LATIMER, M.D.

Wirth, K., and Peters, M. A Contribution to the Subject of Roentgen Treatment of Early Mastitis in the Puerperium (Beitrag zur Roentgenbehandlung der puerperalen Fruehmastitis). *Muenchener med Wchnschr*, 1939 1 59.

Following a brief consideration of the methods used for years in the treatment of early infiltrative mastitis (moist dressings, alpine-lamp radiation,

ains that if the methods of nerve repair used in these experiments are applied in clinical practice they will improve the results obtained in peripheral nerve injuries.

ALICE M. MINTZ.

Leontostavsky, A. S. Morphological Changes in Nerves of the Anterior Extremities in Laboratory Animals After Experimental Ischemia. *Vopr. khir.* 1940, 59: 555.

Numerous physiologists emphasize the stability of nerves in the presence of disturbed blood supply, but such observations are not in accord with the morphological findings. Trophic lesions in animals after complete severing of the nerve trunks in the anterior extremities are rare. Clinical observations demonstrate the gravity of pathological processes in the lower extremities in man under the influence of prolonged disturbance of the peripheral circulation of the blood, while such sequelae are relatively rare in the upper extremities.

In 8 rabbits, 5 rats, and 7 frogs under ether anesthesia the author cut the left subclavian artery between two ligatures, 0.5 cm. distal to the origin of the vertebral artery. No disturbance of the function of the involved extremity followed. The period of observation was fifteen days in the rabbits and rats, and from sixty to seventy-five days in the frogs. No histopathological changes could be detected in the corresponding peripheral nerves in the rabbits and rats twenty-four hours after the ligation of the artery. After from thirteen to fifteen days the nerve trunks of the rabbits' arms still remained intact but in the forearms signs of perineuritis appeared, and several nerve fibers showed symp-

toms of Wallerian degeneration. Dilated blood vessels with intensely stained endothelial nuclei are visible in the perineurial spaces. In some fibers myelin globules, deeply stained with osmic acid, are visible. In Nissl specimens the author found hypertrophied Schwann's cells with deeply stained nuclei and vacuoles in the protoplasm, while in the perineurial spaces proliferation of fibroblasts was noticed.

A similar pathological process with signs of degeneration but with a more rapid evolution was observed in the rats. All the changes are confined to the nerves of the forearm. The nerve trunk of a large number of nerve bundles were filled with granular cells. Not only as the cycle of evolution of degenerative changes accelerated in the rat as compared with the rabbits but also the stage of restitution was usually reached much earlier.

In specimens impregnated with silver no changes in the axial cylinders of the nerve fibers could be detected in the anterior extremities of the rats or rabbits. Intra vitam no motor sensory or trophic disturbances could be found.

A comparison of the above findings in the anterior extremities of the animals with the findings of other authors in posterior extremities shows a lesser intensity of pathological changes in the nerve parenchyma and the vasculoneuroneuronal apparatus in the front legs, although the character of the changes was identical.

A digital compression of the main artery supplying an extremity causes a much less severe trauma of the peripheral nerves than the application of tourniquet.

JOSEPH E. NEE, M.D.

tively slight injury may cause fracture of the ribs. The seriousness of the chest injury cannot be gauged by apparent injury of the chest wall, but can only be estimated by the amount of damage which has been done to the underlying intrathoracic organs. The most common complications of chest injuries are hemothorax, pneumothorax, and subcutaneous emphysema. The author discusses the attitudes toward therapy and points out that conservatism is usually the safest.

The emergency treatment of penetrating wounds of the chest is more difficult and less satisfactory than that of non-penetrating injuries. The first and most important consideration is to close the defect in the chest wall as well as possible under the existing circumstances, either by suture or by compression bandage.

The author discusses the complications of traumatic chest injuries with regard to injuries to the blood vessels, traumatic diaphragmatic hernia, and wounds of the heart. He gives the physical findings which indicate the presence of one of these complications, and stresses the importance of recognizing them early. Late complications of traumatic chest injuries are relatively rare. Empyema may follow hemothorax or pneumothorax, and occasionally one sees lung abscesses.

PAUL MERRELL, M D

Edwards, F R, and Davies, H M. Traumatic Hemothorax, Response of the Pleura to Blood, Treatment, Infected Hemothorax and Foreign Bodies, Re-Expansion of the Lung. *Lancet*, 1940, 239 673

Hemothorax complicates 70 per cent of the chest injuries in modern warfare. Injury to a main blood vessel produces death rapidly, but, fortunately, this occurs in only a small number of cases. Bleeding from the lung usually ceases spontaneously because the pressure in the pulmonary vessels is low, the vessels easily retract, and the collapse of the lung collapses the vessels. Bleeding from an intercostal artery or the internal mammary artery is apt to continue and considerable loss of blood occurs.

Two factors are responsible for death—loss of blood and compression. The loss of three pints may cause death, but generally bleeding ceases before that amount is lost. Symptoms of excessive loss of blood should indicate an injury to a large or to a systemic vessel.

Blood has a very irritative effect on the pleura. Thoracoscopy reveals both the visceral and parietal pleura to be reddened and markedly edematous with large areas of acute hyperemia associated with numerous punctate hemorrhages. A number of sub-endothelial bullæ are seen, these are caused by air getting between the endothelium and endothoracic fascia. Massive clotting of the blood does not occur but fibrin is deposited in shreds on the pleura in large quantities. Organization of the fibrin may be sufficient to prevent reexpansion of the lung, but, fortunately, not often. This pleural reaction results in the pouring out of serum high in protein content,

which fluid, added to the blood, results in massive accumulations severe enough to compress the contralateral lung. Infection occurred in 17 per cent of the cases.

The irritative effect of blood on the pleura results in a considerable rise in temperature. Pyrexia is closely associated with the degree of tension of the hemothorax and usually drops after aspiration. The pyrexia of empyema is usually septic in type and the patients look toxic, but the pyrexia due to blood is maintained on an even keel and the patients are not toxic.

Immediate treatment should be directed to combating shock, and is best accomplished by transfusions of blood or blood substitutes. Open chest wounds should be closed as rapidly as possible. Evidence of injury to an intercostal or to the internal mammary artery should justify exploration of the wound to ligate the vessel.

Pulmonary bleeding will usually stop of itself and conservatism should be the keynote of treatment, though very occasionally one may be justified in opening the chest to control serious hemorrhage. Opiates should be administered freely and oxygen given for dyspnea.

Tension within the chest should be relieved by aspiration and replacement with air. Patients should be closely watched for pressure symptoms. If infection supervenes, closed intercostal drainage should be performed, but if many clots are present a rib resection should be done and the clots removed or washed out. The continued treatment is that of empyema.

Foreign bodies in the wound should be removed during the preliminary toilet of the wound, in the pleural cavity they should be left until a later stage, and foreign bodies in the lung should not be removed unless they produce symptoms.

The authors believe that small collections of blood will absorb rapidly and should be left alone. They believe that large collections should be aspirated and replaced with air. Breathing exercises are an important aid in re-expanding the lung.

JULIAN A MOORE M D

Grimes, A E. Lung Abscess. *Kentucky M J*, 1940, 38 430

In this article, the author has given a complete picture of acute putrid lung abscess. He has shown the poor results of conservative treatment and the good results of early surgical drainage. He maintains that most cases are the result of the aspiration of infected material into the smaller bronchi, that most abscesses are peripheral in their location, and that most of them are covered with protective pleural adhesions.

Accurate localization can be accomplished by means of anteroposterior and lateral roentgenograms and bronchoscopy. With accurate localization, external drainage can be done in one or two stages. The author has pointed out that the recent surgical experience of several capable surgeons has

diathermy softx radiation, and ex. parenteral protein-therapy (see Bier's section) the three discuss the roentgen therapy of puerperal mastitis. This consists of local anti-inflammatory irradiation, so called Roentgenachwachbestrahlung (roentgen mild-irradiation) or RSB which is administered within forty-eight hours of the appearance of the first symptoms.

The author has had 3 cases of mastitis under observation in one and a half years, whereof 2 already recovered, are treated operatively. Eight of the patients had received the customary treatment—evacuation and blading of the breast, emptying by pump, and the application of ice-bags. Of these conservatively treated patients, who served as control for the patients treated by irradiation, 6 were discharged as cured and 2 developed abscess and had to be incised. The remaining 16 patients were given roentgen irradiation. Twelve of these were cured and the rest had to undergo some form of surgical treatment. This, however together with the preceding irradiation, resulted in grave complications. Two extensive, and 2 abbreviated case histories of the 4 patients with complications are appended. In the first case following two irradiation treatments which had been administered to a new area of infiltration in the lower outer quadrant three weeks after incision of the original area in the upper quadrant is a chronic inflammatory edema spread locally over the entire breast this made treatment extremely difficult and markedly prolonged the course of the disease. In the second patient the process, in spite of the irradiations, went on to abscess and had to be incised. Following this a chronic inflammatory edema appeared and spread over the entire breast. In addition to this, on the fifth day after the incision, an erysipelas, which took origin from the area of the incision, developed. In the third patient of this group an abscess developed in spite of the immediate roentgen-ray treatments which were given in three sittings. Finally, in the fourth patient there developed, following the irradiation, chronic inflammatory infiltration which is only slowly resorbed following treatment over period of months.

The author comes to the following conclusions. Roentgen treatment promises little in deeply situated infiltrations and nodulations, and in later stial mastitis as a fact it may do harm by leading to more intense necrosis of the tissue than that which follows the usual methods of combating the condition. Of course the results are more favorable in the cases of superficial, parenchymatous mastitis, in which early application of the roentgen therapy is often about the course of the inflammation completely. Advantages of this form of roentgen therapy lie in the rapid disappearance of pain with retention of the ability to suckle, while the remaining inflammatory manifestations are favorably influenced. In the author's opinion, however the usual methods in this connection are not much inferior to roentgen irradiation. (H. BARNES) JOSEPH W. BARNES, M.D.

Dewarick, E. A., and Jemop, W. H. G.: The Nerve and Cause of Swelling of the Upper Limb After Radical Mastectomy. *Brit J Surg* 4:40, 1917.

Evidence of the nature of the swelling of the upper limb after mastectomy was obtained by three different methods namely clinical observation, roentgenographic study and study after the injection of the lymphatics into the

Clinical observation showed that the swelling was of two kinds, one pitting, the other non-pitting. The usual assumption that pitting indicates the presence of edema fluid is supported by observation of the shrinkage which occurred with continuous suspension of the limb.

There was no evidence of venous obstruction in the cases investigated. Increased venous pressure occurring during exercise is a contributing factor to the swelling only in the presence of lymphatic obstruction.

Postoperative lymph flow as investigated by means of the injection of the skin with dye showed that the flow may be unaltered, diminished, or stopped. Lymphatic obstruction alone is sufficient to cause swelling. Neither sound syphilis, recurrent attacks of inflammation in the limb, nor deep ray therapy is necessary for its development or persistence.

The infrequent development of swelling following standardized operation may be due to variations in the extent to which the main lymphatic trunks draining the upper limb are excised.

The delayed onset of swelling which in some cases as late as sixteen years following operation may be due to a combination of partial lymphatic obstruction and loss of skin elasticity.

Preservation of the main lymphatic trunks by leaving sufficient thickness of subcutaneous tissue on the upper axillary flap should decrease the incidence of the complication.

(NORM. C. BULLOCK, M.D.)

TRACHEA, LUNGS, AND PLEURA

Blades, E.: Emergency Treatment of Traumatic Chest Injuries. *Surg Clin North Am* 1920, 20:473.

It is pointed out that around automobiles crowd for the great majority of traumatic wounds of the chest. The emergency treatments of these traumatic chest injuries are discussed with regard to shock and means of counteracting the shock. It is stressed that immobilization by trapping the head in a bear hug is affording relief but this relief depends upon the degree of immobilization of the entire body. The most common injury is a non-penetrating wound of the chest is fracture of one or more ribs, and the pain and shock associated with this condition make it a serious intrathoracic danger.

In younger people it is possible to sustain severe intrathoracic injury without evidence of rib fracture. In adult the bones become brittle and rela-

on the long axis of the heart is not a factor in extrinsic lesions, and does not disturb the heart. It does not produce dilatation, hypertrophy, or failure of the heart.

4 *Compression* This may be acute or chronic. Acute compression is always produced by a fluid pressure upon the outside of the heart, the fluid usually being in the pericardial cavity (stab wounds of the heart, purulent pericarditis), although it may be in the mediastinum. A gas under pressure (pressure pneumothorax) may also exert compression upon the heart.

Beck's diagnostic triad for acute compression consists of a rising venous pressure, a falling arterial pressure, and a small quiet heart. An acute compression of about 20 cm of water usually results in death.

Chronic compression of the heart differs in several ways from acute compression. The venous pressure can rise much higher. The arterial pressure does not fall particularly. The pulse pressure is narrow and not infrequently waxes and wanes with respiration. The heart is always small and atrophic, it cannot dilate nor can it undergo hypertrophy.

The circulating blood volume increases, and the cardiac output per unit of time is reduced. The patient becomes waterlogged, due apparently to the high venous engorgement that accompanies chronic cardiac compression. The lips and nails are cyanotic, the abdomen, thorax, and soft tissues contain free fluid or edema. The heart is quiet, the sounds are distant, and there is no pre cordial activity.

The various lesions that can produce chronic compression of the heart are pericardial compression scars (not adhesions), blood, pus, transudate or exudate in the pericardial cavity or mediastinal space, tumors of the heart or pericardium, and several other rare conditions. The roentgenological and fluoroscopic examinations are valuable in making a differential diagnosis.

The surgery of compression scars is dramatic in its performance and scarcely less than miraculous in its immediate and remote effects upon the patient. The cure is permanent, and the risk of the operation is not great if the surgeon gives every consideration to his problem. There is no other treatment except operation.

SAMUEL H. KLEIN, M.D.

Touroff, A. S. W., and Vesell, H. *Experiences in the Surgical Treatment of Subacute Streptococcus Viridans Endarteritis Complicating Patent Ductus Arteriosus*. *J. Thoracic Surg.*, 1940, 10: 59.

Cardiac insufficiency and subacute bacterial endarteritis are the two most serious complications of patent ductus arteriosus. Abbott, from post-mortem examinations, found that 30 per cent of the deaths occurring in cases of this congenital cardiac lesion resulted from the complicating bacterial endarteritis. Only 1 spontaneous recovery has been reported. Until recently, patent ductus arteriosus with subacute bacterial endarteritis was treated only by medical means.

The rationale of surgical treatment in cases of infected patent ductus is based upon the observation that ligation or excision of a large venous channel which is the site of an infected feeding focus often proves effective in controlling bacteremia. The prerequisites for successful surgical eradication of infection would appear to be (1) that the vegetations be confined to the ductus, and (2) that the ductus be of sufficient length to permit excision. If vegetations have extended into the left side of the heart or aorta, operation would seem inadvisable for foci would still discharge into the peripheral circulation despite successful surgery.

The authors working at Beth Israel Hospital in New York attempted obliteration of the patent ductus in 4 cases complicated by subacute bacterial endarteritis. In the first case, although two episodes of minor pulmonary embolization occurred on the fourth and ninth postoperative days, the patient recovered from his bacterial endarteritis. In the second case the patient did not recover from the bacteremia even though the operation was successful.

In the last 2 cases exsanguination of the patients occurred during the operation as a result of the procedures involving the ductus.

The authors are not discouraged by their high mortality because of the high mortality under medical management. J. DANIEL WILLEMS, M.D.

Armstrong, T. G. *Adherent Pericardium, Constrictive and Non-Constrictive*. *Lancet*, 1941, 239: 475.

Adherent pericardium consists of two general types—constrictive and non-constrictive. The author presents evidence to show that the two groups exhibit entirely different histological characteristics, and probably have a different etiology. The density and toughness of the fibrous tissue covering the heart is the deciding factor in producing cardiac compression.

A complete clinical, histological, and pathological study was made in 38 cases. The constrictive group consisted of 10 cases, 6 post mortem, and 4 operative. The non-constrictive group consisted of 28 cases, 20 of which were rheumatic and 8 non-rheumatic. Enlargement of the heart, when present, was invariably associated with rheumatic pancarditis, valvular lesion, or cardiovascular disease. Adherent pericarditis *per se* apparently causes no cardiac enlargement.

The constrictive group presented the following pathological picture.

The pericardium was extremely thick, dense, and tough, sections being composed of an avascular, interlacing system of dense whorls of hyaline fibrous tissue resembling fibrocartilage. The individual fibers were thick, swollen, and structureless, and there was no cellular infiltration. Calcification in the form of nodules, or even plates, was present in 8 of the 10 cases, and there were patches of caseous debris in many places. In 1 instance true bone was

shown that surgical drainage of lung abscess within the first six weeks of its course has greatly reduced the morbidity and mortality of this disease.

J. M. A. Moore, M.D.

Rolland, J. and Tsoutsis, N. A Contribution to the Study of the Surgical Treatment of Pulmonary Abscess (Contribution à l'étude du traitement chirurgical des abcès pulmonaires). *Presse Méd. Par.* 940, 48, 705.

Rolland and Tsoutsis note that while pulmonary abscess is usually a serious condition, spontaneous healing may occur, and surgical treatment should not be undertaken before sufficient time has elapsed to show a tendency toward healing. On the other hand, surgical treatment when indicated should not be too long delayed or complications will develop. A diminution in the size of the original lesion may occur only to be followed by relapse and the appearance of another lesion of a more serious character or multiple lesions. It is difficult to formulate any definite rule that is applicable in all cases. With regard to the best time for surgical intervention in pulmonary abscess. In the majority of cases, delay of two months as suggested by Sergent and his associates, may be allowed. However in some cases, the condition is too serious to permit surgery to be delayed so long.

When surgery is indicated, it is most important to determine the exact location of the abscess by roentgenological study. The authors have found the fluoroscopic examination of the greatest value for this purpose. A final roentgenological examination should be made immediately before operation. The first step in the operation for pulmonary abscess is to determine whether or not the pleura is freely movable or whether adhesions are present. This is done with the use of trocars with technique very similar to that used for artificial pneumothorax except that no air is injected into the pleural cavity. As the trocar is introduced into this cavity, the manometer shows definite oscillations if the pleura is free. If this is the case, adhesions must be created by the injection of substance such as quinine ethazone or dilute tincture of iodine. There is pain at first, but this rapidly subsides, and within a few days adhesions have formed without any pleural effusion.

If pleural adhesions are present, this procedure is not necessary. When pleural adhesions are present or have been created, and the general condition of the patient is good, rib resection can be done, and the abscess cavity can be opened, emptied, and disinfected. If the patient shows evidence of toxemia, less extensive resection may be done, and drainage of the abscess should be instituted, if the patient's condition is very poor. Simple incision with the introduction of an opaque drainage tube into the abscess with the aid of trocars is sufficient. With such methods of drainage the infection and toxemia are diminished, and when the patient's condition has improved, more extensive operative procedure can

be carried out to obliterate the abscess cavity completely. For this purpose electrocoagulation or the electric cutting current is employed. This same method is employed whether simple abscess or pyocystitis is present.

The production of pleural adhesions as a preliminary step in the surgical treatment of pulmonary abscess, the authors believe, protect the pleural cavity from infection and greatly improves the prognosis. A similar measure they suggest, might be used in lobectomy with definite improvement in the results of the procedure.

Lucy M. Fry

HEART AND PERICARDIUM

Beck, C. B. Extrinsic Lesions of the Heart. *Texas State J. M.* 940, 35, 468.

The heart with extrinsic lesion is good organ that has become crippled by some outside factor. Extrinsic heart lesions deserve special consideration because if this outside factor can be removed by operation, the heart again becomes good organ and the patient can be cured. The author classifies these extrinsic lesions of the heart as follows:

1. *Angulation.* This may be caused by adhesions to the lungs, chest wall or diaphragm, pneumothorax, rib dislocation of the mediastinal tract, mediastinal pleural cavity, rib dislocation of the mediastinal structures and tumors of the heart, pericardium, and mediastinal structures. It is emphasized that angulation of adhesions of the heart is produced by infections that existed outside of the heart, namely pyogenic or tuberculous infections. The adhesions of rheumatic heart disease, as a rule, are elastic and do not cripple the heart. In general, the author believes that operation for cardiac adhesion in the presence of rheumatic heart disease is not indicated.

2. *Experimental studies in the dog.* It has been shown that in angulation of the heart either the right or left, about displacement of the mediastinum, the arterial pressure falls, the venous pressure rises and, as a rule, tachycardia appears. These alterations disappear after replacement of the heart to its normal position.

3. *Rotation.* The heart can be rotated in clockwise or counter-clockwise direction. This is seen in patients with adhesions, neoplasms and pneumothorax.

In the experimental animal, rotation of the heart produces fall arterial pressure, rise in venous pressure and tachycardia. These disturbances are more marked than those produced by angulation. The author has observed these phenomena in human patients during rotation of the heart for the resection of scars from the posterior surface of the ventricles. This rotation should be given for only a few moments at a time, and ample rest period are necessary for the recovery of the circulation and the prevention of ventricular fibrillation.

4. *Traction.* It has been established by considerable study in the thoracic laboratory that traction

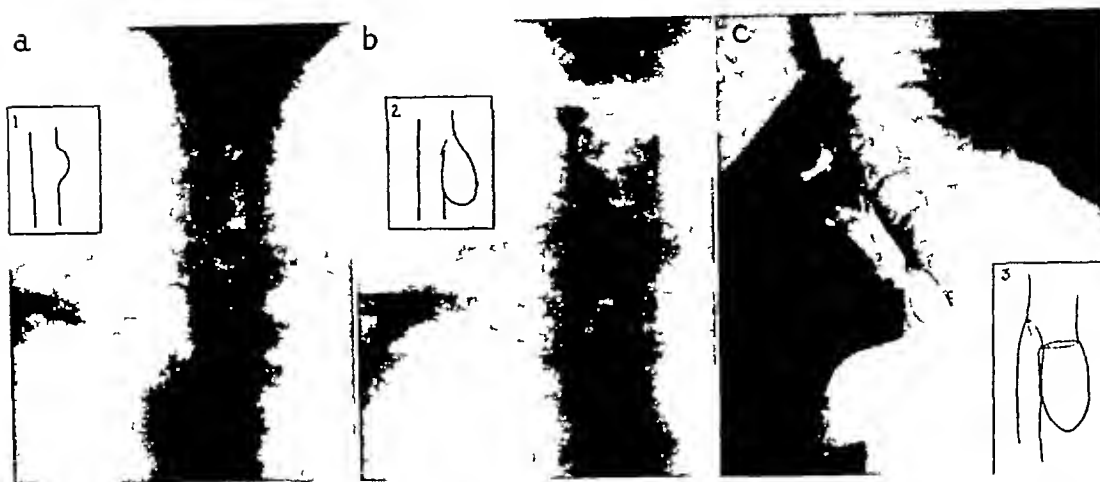


Fig 1 Roentgenogram *a* demonstrates the smallest type of esophageal diverticulum in its very earliest stage. Note that at this stage the sac has no neck. In insert 1 may be seen diagrammatically the early stage, in which the submucosa bulges through the fibers of the inferior constrictor muscle without as yet having produced a sac possessing a neck. Roentgenogram *b* represents a fully developed esophageal pulsion diverticulum with a definite neck, it is now at an operable stage. Note (insert 2) the diagrammatic illustration of the relation of the false opening into the diverticulum to the true opening into the esophagus. Note that the opening into the esophagus is in the lateral position

at this stage, so that food still passes readily through the transverse opening into the true esophagus without difficulty. Roentgenogram *c* represents the stage of development in the esophageal diverticulum in which because of traction on the sac, the opening into the diverticulum (insert 3) is transverse and the opening into the esophagus lateral. One can appreciate from this diagram how food passes more readily into the diverticulum sac than into the esophagus and how traction with swallowing on the food-filled sac pulls the lips of the laterally placed opening into the esophagus together, which interferes further with the entrance of food into the true esophagus.

cricopharyngeal muscles and the almost transverse fibers of the inferior constrictor muscle. The earliest symptom associated with esophageal diverticula occurs at this time, solely the feeling of a piece of food stuck in the throat, which causes an annoying cough and an endeavor to get it up. As at this stage, there is no neck to the sac, no operation should be considered. In Figure 1*b* may be seen the completely formed diverticulum sac with a well developed neck and a dependent sac. This stage represents further advance from the first or teatlike stage and complete herniation of the pharyngo-esophageal mucosa and submucosa between the most inferior fibers of the lowest constrictor muscle and the oblique fibers of the cricopharyngeal muscles. It represents the development of a true hernial sac comparable with the sac of a fully developed oblique inguinal hernia.

In this second stage it is to be noted (Fig 1*b*) that while the fully developed sac is still moderately small, the opening into the sac is in the oblique direction on the lateral wall of the esophagus and the opening into the true esophagus is still in the transverse position. In this stage a large portion of the food still passes satisfactorily by the lateral opening of the esophagus into the diverticulum and descends along the longitudinal esophagus into the stomach without obstructive symptoms. The only inconveniences suffered by the patient are those related to the accumulation of food and mucus within the sac. There is regurgitation of food eaten at a previ-

ous meal, mixed with mucus. The patient frequently complains that as he swallows food gurgling noises may be heard in the throat.

Stage 3, illustrated in Figure 1*c* and insert 3, represents the most advanced stage of a pharyngo-esophageal diverticulum. The sac has become large and has descended into the mediastinum. Downward traction on the food-filled sac converts the sac opening (Fig 1*c*, roentgenogram and insert) into a transverse one. Downward traction on the sac so angulates the esophagus that the direct course of the descending food is into the diverticulum itself. This tends not only to enlarge the sac but also to force it by the weight of its retained food and by the traction on the food filled sac with swallowing always in a downward direction into the mediastinum. This likewise angulates the true opening into the esophagus so that it assumes a lateral position. The true opening into the esophagus tends to have its lip so pulled together that, as it is viewed through the esophagus, the opening into the true esophagus is frequently represented only by a longitudinal slit. It is at this stage that obstructive symptoms tend to appear since the first food swallowed fills the sac, and exerts traction on the now laterally placed true opening of the esophagus which tends to close it. Food then finds its way into the true esophagus and stomach with difficulty.

The technique which the author describes is begun by a long longitudinal incision in front of the sterno-

present. \t tubercular bacilli or other bacteria were found with special staining methods.

In contrast, in the non-constrictive group the res of fibrosis were much thinner. There as considerable cellular infiltration and the collagen fibers were fine delicate and vly Calcification and caseation were not present.

The non-constrictive type of adherent pericardium probably follow rheumatic pericarditis, but the constrictive type apparently never follows rheumatic inflammation. It is certain that constrictive pericarditis follows tuberculous pericarditis, and it is probable that some cases are the end result of an often unrecognized septic pericarditis.

LARRY H. HOUER M.D.

ESOPHAGUS AND MEDIASTINUM

Schatzki, R. The Roentgen Demonstration of Esophageal Varices; Its Clinical Importance. *Arch Surg* 940, 4 074

The demonstration of esophageal varices is of clinical importance in the diagnosis of cirrhosis of the liver of Banti's syndrome and of primary carcinoma of the liver. It is of great help in the differential diagnosis of hematemesis, ascites, and splenomegaly. The varices produce wormlike, uneven surfaces which bulge into the lumen of the esophagus. These can be demonstrated on roentgenogram by coating this organ with this layer of

barium, the ordinary barium-ter mixture. They are demonstrated best at the end of deglutition and with the patient in horizontal position. Esophageal peristalsis and deep respiration will empty the varices.

SAMUEL PRYDELL M.D.

Labey F H. Esophageal Diverticula. *Arch Surg* 940, 4 8.

Historical data show that preternatural pockets in the esophagus are found to topography early as 764. In 1877 these are classified into traction and pulsion types. In 1900 new classification was made.

Traction diverticula were first correctly described in 1840. The first surgical treatment as excision, which as done in 1884. In 1900 the first o-stage operations are first performed. In 1933 the author modified the first o-stage operation.

When the sac is small, the tip of the sac after dissection turned by the thorax the sternohyoid muscle at level higher than its neck. When the sac is large the sac is implanted into the sternum printing up and

Esophageal diverticula divide themselves into two main types: true diverticula represented by the traction type of sac which is made up of all the coats of the esophagus, and false diverticula represented by the pulsion type which are so commonly seen at the pharyngo-esophageal junction and therefore named the "pharyngo-esophageal diverticula." The latter occur at three levels: those at the pharyngo-esophageal junction represented by the pharyngo-esophageal pulsion diverticula; those in the intrathoracic portion of the esophagus, particularly at the level of the main bronchial stem, represented by the traction diverticula; and those just above the diaphragm, the pulsion type.

By far the most common type, and certainly the type most prone to produce troublesome symptoms is the pharyngo-esophageal diverticulum. This has been well described corresponding in its origin to an inguinal hernia. It is true herniation of mucosa and submucosa through the lowest fibers of the inferior constrictor muscle as they run transversely or through the obliquely dividing fibers of the cricopharyngeal muscles on the posterior aspect of the esophagus. This lesion is a dark spot on the posterior wall of the esophagus. It consists of a point or dimple on the posterior wall of the pharynx at the cricopharyngeal junction which is unsupported or badly supported by muscular covering. It is probable that in some persons there is at this point, as in those with true inguinal hernia, congenital weakness in the muscular covering. Taken together with neuromuscular incoordination, this results in bulging of the mucosa and submucosa at the dark point just as such bulging occurs through an inguinal ring in the early stages of an inguinal hernia. This period is the first stage of the pharyngo-esophageal diverticulum. It is shown in Figure 1. At this period of development no semblance of sac is present only tentlike projection of mucosa bulges between the oblique fibers of the



Fig. Changing size of varices during peristalsis in patient with Banti's syndrome. The two pictures were taken within few minutes of each other in identical position of the patient. A: extensive varices during the resting phase of the esophagus. B: crowding of most varices during the contraction of the esophagus.

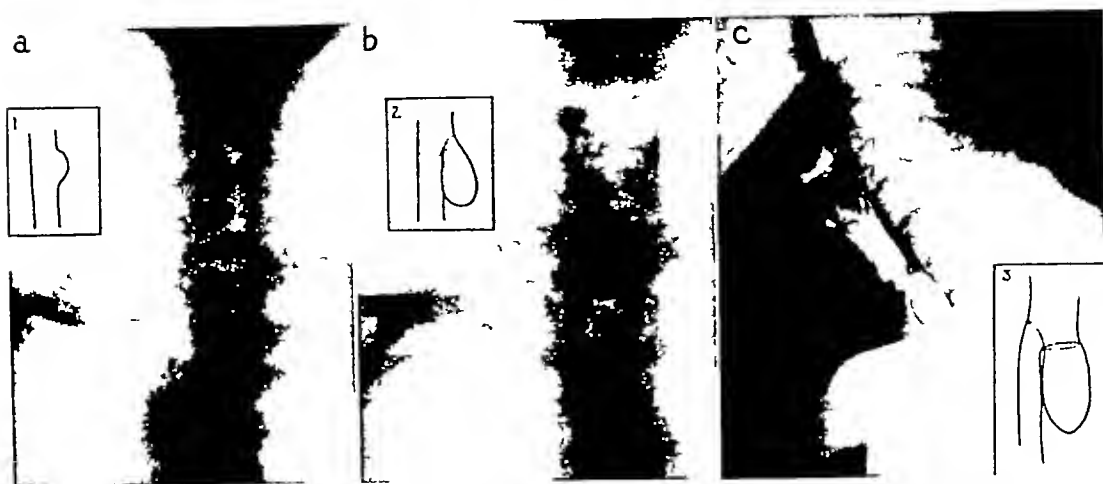


Fig 1 Roentgenogram *a* demonstrates the smallest type of esophageal diverticulum in its very earliest stage. Note that at this stage the sac has no neck. In insert 1 may be seen diagrammatically the early stage, in which the submucosa bulges through the fibers of the inferior constrictor muscle without as yet having produced a sac possessing a neck. Roentgenogram *b* represents a fully developed esophageal pulsion diverticulum with a definite neck, it is now at an operable stage. Note (insert 2) the diagrammatic illustration of the relation of the false opening into the diverticulum to the true opening into the esophagus. Note that the opening into the esophagus is in the lateral position

at this stage, so that food still passes readily through the transverse opening into the true esophagus without difficulty. Roentgenogram *c* represents the stage of development in the esophageal diverticulum in which because of traction on the sac, the opening into the diverticulum (insert 3) is transverse and the opening into the esophagus lateral. One can appreciate from this diagram how food passes more readily into the diverticulum sac than into the esophagus and how traction with swallowing on the food-filled sac pulls the lips of the laterally placed opening into the esophagus together, which interferes further with the entrance of food into the true esophagus.

cricopharyngeal muscles and the almost transverse fibers of the inferior constrictor muscle. The earliest symptom associated with esophageal diverticula occurs at this time, solely the feeling of a piece of food stuck in the throat, which causes an annoying cough and an endeavor to get it up. As at this stage, there is no neck to the sac, no operation should be considered. In Figure 1*b* may be seen the completely formed diverticulum sac with a well developed neck, and a dependent sac. This stage represents further advance from the first or teatlike stage and complete herniation of the pharyngo-esophageal mucosa and submucosa between the most inferior fibers of the lowest constrictor muscle and the oblique fibers of the cricopharyngeal muscles. It represents the development of a true hernial sac comparable with the sac of a fully developed oblique inguinal hernia.

In this second stage it is to be noted (Fig 1*b*) that while the fully developed sac is still moderately small, the opening into the sac is in the oblique direction on the lateral wall of the esophagus and the opening into the true esophagus is still in the transverse position. In this stage a large portion of the food still passes satisfactorily by the lateral opening of the esophagus into the diverticulum and descends along the longitudinal esophagus into the stomach without obstructive symptoms. The only inconveniences suffered by the patient are those related to the accumulation of food and mucus within the sac. There is regurgitation of food eaten at a previ-

ous meal, mixed with mucus. The patient frequently complains that as he swallows food gurgling noises may be heard in the throat.

Stage 3, illustrated in Figure 1*c* and insert 3, represents the most advanced stage of a pharyngo-esophageal diverticulum. The sac has become large and has descended into the mediastinum. Downward traction on the food-filled sac converts the sac opening (Fig 1*c*, roentgenogram and insert) into a transverse one. Downward traction on the sac so angulates the esophagus that the direct course of the descending food is into the diverticulum itself. This tends not only to enlarge the sac but also to force it by the weight of its retained food and by the traction on the food-filled sac with swallowing always in a downward direction into the mediastinum. This likewise angulates the true opening into the esophagus so that it assumes a lateral position. The true opening into the esophagus tends to have its lip so pulled together that, as it is viewed through the esophagus, the opening into the true esophagus is frequently represented only by a longitudinal slit. It is at this stage that obstructive symptoms tend to appear since the first food swallowed fills the sac, and exerts traction on the now laterally placed true opening of the esophagus which tends to close it. Food then finds its way into the true esophagus and stomach with difficulty.

The technique which the author describes is begun by a long longitudinal incision in front of the sterno-

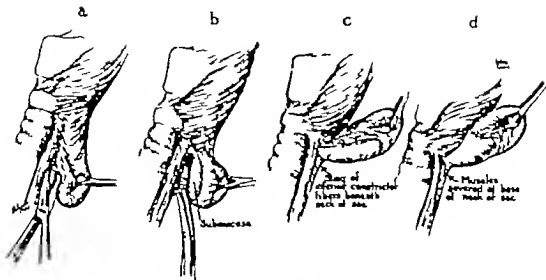


Fig. 2. In Illustration a may be seen diagrammatically the plan of separating the dependent sac of the diverticulum from the longitudinal esophagus, to which it is adherent and over which run the enveloping fibers of the cricopharyngeal muscle. Note the sac grasped with the Babcock blunt forceps so that traction can be made on it to facilitate the separation. In Illustration b the anterior fibers enveloping the all of the sac have been separated, and the posterior fibers are now being cut. Note the appearance of the subcutaneous as the fibers recede over the sac and enveloping it. With the longitudinal esophagus are severed. Note particularly (Illustration c) that the sac has been completely dissected up to its neck and that the sling fibers of the inferior constrictor muscle immediately beneath the neck of the sac have as yet not been severed.

It is failure to sever these sling fibers that is so apt to bring about production of stricture by means of which food is caught and recurrence of the herniation encouraged. In addition to this, failure to cut these sling fibers makes it impossible to mobilize the sac upward so completely that

but as an acute angle at the lower aspect of the neck can be adequately converted into an obtuse angle. In Illustration d may be seen the completely freed subcutaneous and the fascial of the sling fibers of the inferior constrictor muscle immediately beneath the neck of the sac. This diagrammatic Illustration demonstrates the completely mobilized sac with its subcutaneous and all of the muscle fibers about the neck of the sac freed and cut. It is now ready to be implanted high in the neck.

cleidomastoid muscle. The success of this operation is related to the thoroughness with which the neck of the sac is completely freed of all of its covering muscle fibers. The operative technique of the dissection is shown in Figure 2. This muscle is dissected back until the omohyoid muscle is well demonstrated. The omohyoid muscle is then severed at its upper attachment and at the point where it disappears beneath the sternocleidomastoid muscle. It is amputated at this point. With the omohyoid muscle out of the way the thyroid gland is separated from the internal jugular vein and the common carotid artery and is pulled toward the middle line. The inferior thyroid artery is cut between forceps and ligated. After this the patient is asked to swallow and the sac of the diverticulum will immediately be seen to ascend and descend. The enveloping fibers of the cricopharyngeal muscle are separated at the lowest angle of the sac and the dome of the sac is grasped with blunt forceps and lifted upward. While the neck of the sac is then completely dissected. With the sac hanging entirely by its neck it becomes extremely important to dissect with meticulous care all of the muscle fibers about the neck of the sac

and particularly those fibers acting as a sling at the most inferior angle of the neck of the sac, (Fig. 2c).

The sac is then carried upward over the upper pole of the thyroid gland and pinned with two stitches with black silk to the uppermost fibers of the sternohyoid muscle. After this implantation of the sac, the gauze end of good-sized cigarette drain is inserted into the mediastinum to produce sifting-off granulations and is left in place for four or five days. At the end of eight or ten days the second stage of the operation is undertaken. The patient is permitted out of bed and is allowed to swallow food and fluids immediately. Because the tip of the sac is implanted higher than the neck, food can pass readily by the diverticulum opening into the true esophagus and so on down into the stomach.

At the end of eight or ten days the wound is reopened. The finger is inserted along the suture of the wound and the edges of the skin are gradually pulled apart. With the wound well opened, the tip of the sac is located. It is grasped with forceps and it is spread out of the bed, such that it has molded for itself in the tissues until it is entirely free. The tip of the sac is then cut off and the two layers making up the

wall of the sac, the mucosa and the submucosa, immediately become plainly evident. The submucosa may then be grasped with forceps and the mucosa can be easily and completely separated from it until it is entirely freed of the neck of the diverticulum. The mucosa is then cut off at the neck of the diverticulum and a small piece of gauze is inserted in the submucosal canal which remains. This drain is then brought out through the wound. Buried stitches are used to approximate the platysma and the subcutaneous fat and the wound is closed with clips. The submucosal canal, which still points upward, collapses after removal of the drain and this prevents postoperative drainage of food through the wound and the establishment of a sinus. The drain within the canal is removed at the end of four or five days, and healing usually occurs without leakage.

Some of the operative complications which can occur are injury to the recurrent laryngeal nerve, and injury to the superior cervical sympathetic ganglion, which will result in drooping of the lids and Horner's syndrome. Another complication can occur when the sac is pulled too far out into the wound and the longitudinal esophagus is displaced and angulated in such a way that food cannot satisfactorily pass down its course. When the diverticula is large, sacs not infrequently become so enormously distended and tense with air that gangrene may result. Should distention of the sac with air occur, a rubber catheter should be inserted into the sac through its tip. If a perforation of the sac or of its neck occurs during a dissection, this should be carefully sutured with silk with inversion of the point of perforation and accurate closure. One of the most distressing complications is a persisting sinus through which food is discharged for several weeks after operation. Such a sinus is in the author's opinion most often the result of incomplete and inadequate dissection of the sac. Another complication is recurrence, which may be the result of incomplete dissection of the sac at the first operation.

Postoperative dilatation is done in the author's clinic by the laryngologists. A Plummer bag is used and wide dilatation is carried out.

Traction diverticula originate from inflammatory processes in adjacent bronchial lymph nodes. These inflammatory processes involve the esophagus, and, as cicatrization occurs, result in traction bands which pull the esophagus out of direction. The symptoms associated with this type of diverticulum are rarely urgent. They consist largely of partial degrees of obstruction or interference with the progress of food and are, as a rule, promptly relieved by dilatation. Because of the fact that most traction diverticula are pulled in either a lateral or upward direction they tend to empty themselves. Operative treatment is not indicated for diverticula of this type.

Pulsion diverticula (supradiaphragmatic) are extremely rare. They have well developed sacs with narrow necks and their lateral walls tend to become

adherent to the longitudinal esophagus. The symptoms associated with this type are related to the decomposition of food which remains within such a large sac over a long period and the regurgitation of such food during the night which interferes with sleep.

The author has a method of treatment which has proved satisfactory. With the chest open and the lower lobe of the lung held out of the way, this type of diverticulum can be readily dissected so that it hangs freely by its neck. The dome is then fixed with silk stitches high in the pleural gutter beside the vertebral bodies so that it is implanted upward as a cord parallel to the longitudinal esophagus. The sac can thus be converted into a stringlike structure fixed by stitches of black silk which have not passed through all of the walls of the sac and which are caught to the parietal pleura. Food which passes down the esophagus readily passes by the neck of the sac and can be made to enter the sac only when the patient is placed in the Trendelenburg position.

J. DANIEL WILLEMS, M.D.

Neuhof, H., and Rabin, C. B. Acute Mediastinitis
Am J Roentgenol, 1940, 44, 684.

The diagnosis of acute mediastinitis and of mediastinal abscess is based largely on roentgenological examination. The latter is the sole means of accurately localizing such lesions for surgical purposes. Acute mediastinitis will often remain undiagnosed or untreated if roentgenograms are not made, or if its roentgenological features are not understood. Some knowledge of the pathology and the clinical manifestations is necessary for the correct interpretation of films.

Three classifications of acute mediastinitis are made: pathological, etiological, clinical. The pathogenesis is set forth with particular reference to acute infections of the pharynx and injuries to the cervical esophagus. The pathology of mediastinal lymphadenitis, phlegmonous mediastinitis, and mediastinal abscess is described. The special features of mediastinal infection secondary to perforation of the esophagus, and of perforation of mediastinal abscess into the lung are outlined.

The roentgen features of mediastinal lymphadenitis, phlegmonous mediastinitis, and of abscesses in the superior and inferior mediastinum are detailed. Special reference is made to mediastinal abscess derived from esophageal perforation, and to mediastinal abscess which perforates into the lung or the pleura.

A general survey of the clinical manifestations of mediastinal infection is presented; this is based on the cases which were studied, not on the literature. The textbook characteristics of acute mediastinitis were rarely seen. The contrast between large mediastinal abscesses and mild clinical features was emphasized.

The indications for operation and the general principles of operative treatment are discussed.

PAUL MERRELL, M.D.

MISCELLANEOUS

Tschamke, G. A New Method for the Surgical Reduction of the Size of the Chest. Proposal of Operation (Ueber einen neuen Weg zur operativen Brustkorbletzenge. Ein Operationsvorschlag). *Deutsche Zeitsch f Chir* 940, 33 47

The author recalls statement by Sauerbruch to the effect that one of the main requirements for the further development of the surgical treatment of pulmonary tuberculosis is the obtaining of better plombage material. The object of thoracoplasty is the intimate fitting of the form of the thoracic wall to its content the lungs. From this point of view there is in the plombage operation marked malrelation by which the advantages of plombage—the preservation of the thoracic framework and the limitation of the collapse—are actually reduced. This raises the question whether it is not possible to eliminate this malrelation between the form and content in the plombage operation and even to do away with the plombage material altogether.

Perhaps a practical method is offered by reducing the mobilization of the thorax in its expansion, by markedly increasing the mobilization of the thorax in its expansion or by markedly increasing the mobilization in its intensity. This is possible because the ribs can be made pliable and can be depressed to the desired degree and to the indicated sit. The greatest reduction in size can be obtained where the radius of the curvature of the ribs is smallest. The author proposes to cut subperiosteally into segments, from 1 to 3 cm. long, the parts of the ribs that must be mobilized, and to remove sections of bone 5 mm. wide in order to prevent blocking of the segments. To avoid oscillation of the mobilized costal parts during breathing and coughing the author recommends a two-stage intervention in which the ribs with even numbers are cut up in the first sitting and those with odd numbers in the second sitting. In this manner, the stability of the thorax is not endangered and the second stage, which is really the plastic one and follows the first after two or three weeks, is performed during the period of malleable callus formation, and is based on the experience gained from the theory of fracture. This added trusslike support of the depressed costal parts guarantee the preservation of the depression.

The advantages and disadvantages of the depression plastic are compared with those of the plombage operation. The limitation of the collapse to a minimum with marked protection of the healthy parts of the lung is obtained equally well with both methods. The preservation of the thoracic framework is not completely ensured by either. The severity of the intervention by the former method is greater than that of the latter but is reduced by the use of two stages and by the absence of pneumothorax. The scar is markedly larger. On the other hand, many disadvantages of the plombage operation—absent suppuration of the plombage bed, early or late perforation,

elimination or displacement of the plombage, and the dangers of pneumothorax. In addition, the limitations of the use of plombage lose much of their significance—danger of perforation—when located in the pulmonary border danger of displacement when the pleura has not adhered, limitation of the size of the plombage because of the danger of pressure on the heart and the large vessels by the weight of the plombage material. All this shows that the balance is in favor of the depression method.

The mode of action and the possibilities of the procedure are demonstrated by various experiments on models from which plaster casts are taken. Other experiments on models show the extraordinary possibility of reducing the volume of the thorax—for instance, to eliminate residual cavities completely. In this case the anterior lower parts of the lung remain entirely intact, and this is important for the activity of the heart. Up till now the method has not yet been used in practice, but the author recommends that it be tried. If thinks that difficulties may be offered by the possible persistence of expanded pulmonary tissues and secretory conditions above the depression at the apex, and that there may be obstacles due to intercostal muscle, fascia, adherent pleura and lung, pressure on the heart and vessels, the creation of new dead space at the apex of the depression and the technical difficulties of mobilization up to the capitulum.

(BETHUNE) RICHARD KIEHL, M.D.

Ladd, W. E., and Gross, R. E. Congenital Diaphragmatic Hernia. *Am J Surg* 1940, 940, 3 97

The sites where congenital hernia occurs in the diaphragm are in the posterior part of the left and right sides, the foramen of Bochdalek when the defect is due to persistent pleuropontoonal canal, the esophageal opening or the subternal opening commonly referred to as the foramen of Morgagni. Of these hernias that occurring persistent pleuropontoonal canal is by far the most common. The fact that the hernia through the esophageal hiatus is most common in adult life is due to the high mortality in infancy of patients with hernia through the pleuropontoonal canal.

The symptoms of diaphragmatic hernia may be respiratory, circulatory, digestive or combination of all three; they depend on the number of abdominal viscera in the thorax and on the size of the hernial ring. In newborn infants the symptoms of cyanosis, or vomiting, diaphragmatic hernia is one of the conditions that should be considered.

Physical examination may show unduly rapid respiratory and pulse rates and heart displaced from the left side. Percussion of the chest on the side of the hernia may be dull or tympanic according to whether there is fluid or air in the misplaced viscera. Auscultation may reveal absent or distant breath sounds and possibly intestinal gurgles that if present, at once suggest the correct diagnosis. When the major portion of the alimentary

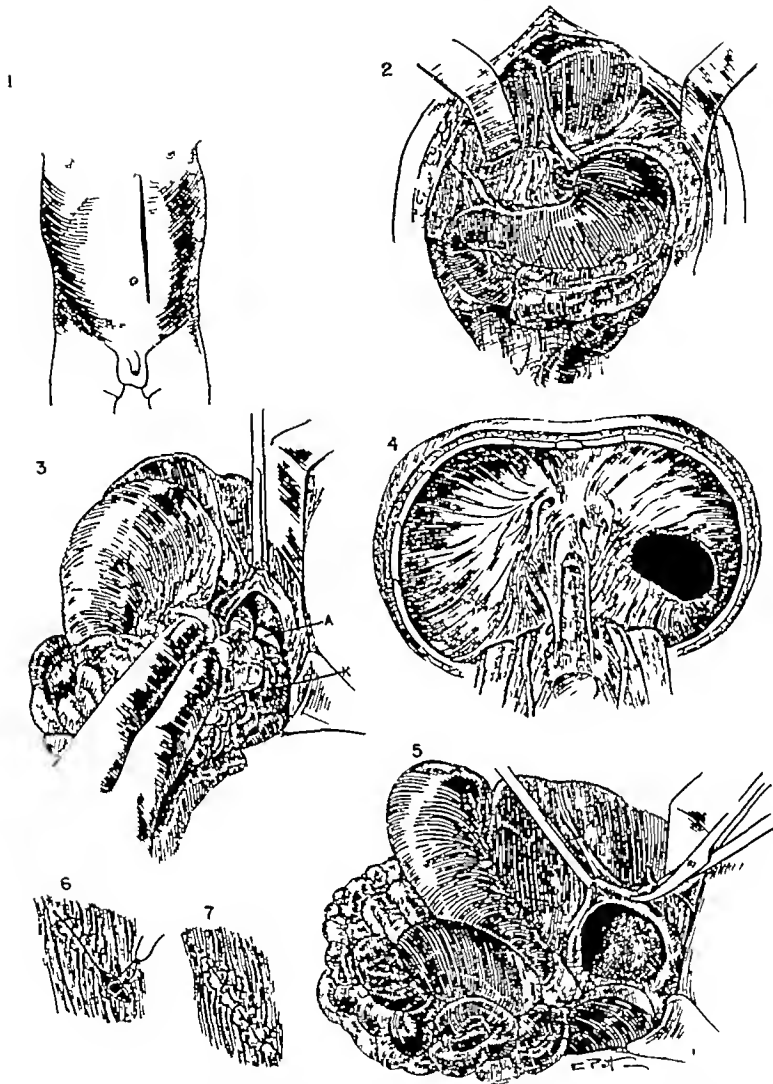


Fig 1 Steps in the surgical repair of a diaphragmatic hernia on the left side 1—position of the abdominal incision, 2—view obtained on opening the abdomen (the stomach and colon are seen projecting up through the diaphragmatic defect, all the intestines, except the duodenum, are in the thorax), 3—withdrawal of abdominal viscera from the chest, 4—schematic view of under surface of diaphragm to show position of the opening in the left, posterolateral aspect of the diaphragm, 5—cutting away rim of the hernial ring to make a raw edge, 6—approximation of the diaphragmatic edges with interrupted mattress sutures of silk, 7—reinforcement of peritoneal edges along the suture line with interrupted silk stitches, A—adrenal gland, K—kidney

tract is in the thorax, tympany is lacking on abdominal percussion, and the abdomen is scaphoid in appearance

Roentgenological examination should always supplement the history and physical examination. A roentgenogram without the use of contrast media

will usually give all the necessary information and is probably safer than giving barium to the baby. If, however, a barium meal is required, only a thin mixture should be used, because there is real danger of causing obstruction or aspiration by giving too thick a mixture to small infants.

The normal findings in the chest are greatly distorted by ray examination. The affected side contains viscera that are continuous with those in the abdomen. The mediastinal structures, including the heart, are pushed to the opposite side and both lungs may be greatly compressed.

The authors believe that there can be no question that surgical therapy is the proper treatment for these patients. There is sufficient evidence from their experience and in the literature to confirm the futility of expectant or medical measures.

The policy of waiting until the child gets older and stronger is apparently responsible for the loss of great many lives that might have been saved by a timely operation. On a theoretical basis, an operation performed in the first forty-eight hours of life is very advantageous. The authors have had an opportunity of doing this in a few cases. Their experience has shown that infants in the first forty-eight hours of life stand major surgical procedures extremely well—in fact, far better than at the end of a week or ten days. Within the first two days one has the advantage of dealing with the intestine before it has become distended and thus of being able to replace the intestines in the abdominal cavity which might otherwise be impossible.

The pre-operative treatment that they believe to be advantageous consists in making sure that the infant is in a proper state of hydration, and that the bowel is deflated as much as possible. The latter can be accomplished by means of enemas, gastric suction, and placing the infant in tent with high concentration (from 90 to 95 per cent) of oxygen.

The anesthetic used in the authors' recent cases was cyclopropane. This gives a maximum content of oxygen, slight positive pressure, and good relaxation, all of which are important in these difficult cases. Its one drawback is of course its inflammability but this risk is justified in view of the many advantages that it possesses. Whatever anesthetic is employed, there must always be provision for giving positive pressure if the need should arise.

It is the authors' practice to paralyze the phrenic nerve through a small suprascapular incision, on the affected side before attempting repair of the hernia. The purpose of this procedure is to facilitate the closure of the hernial opening and to prevent excessive strain on the suture line during healing of the diaphragmatic wound. Immediately after this one should proceed with the repair of the hernia.

The operative procedure is illustrated in Figure One of the greatest problems of operating on these patients in early infancy has been that of finding sufficient room in the underdeveloped peritoneal cavity to receive the abdominal viscera. This problem has now been solved by the procedure here reported of closing only the abdominal skin and allowing the abdominal wall to stretch and then suturing the peritoneum and the rectus muscles at a second operation five or six days later. Nine patients have been successfully operated on by the above.

S. MUEL H. KERN, M.D.

Harrington R. W. The Diagnosis and Treatment of Various Types of Diaphragmatic Hernia.
Am J Surg 40: 30-37

The diagnosis and treatment of diaphragmatic hernia have received more consideration in recent years because the more frequent recognition of this condition has changed its status from that of a rare condition to one that is not infrequently encountered. The diagnosis of interest to the clinician because it is of first importance, the symptoms are often complex and the condition frequently must be differentiated from diseases of the upper part of the abdomen and lower part of the thorax. It is of interest to the roentgenologist because the roentgenological recognition of diaphragmatic hernia is often the only means by which a definite diagnosis can be established clinically. The treatment is of primary concern to the surgeon because operative replacement of the herniated viscera and repair of the abnormal opening in the diaphragm are the only measures that promise complete relief of the symptoms to the patient.

From a clinical and surgical standpoint, the history of preceding injury is helpful in establishing the diagnosis and in determining the type, urgency and prognosis of the operative treatment. Because of the practical clinical and surgical significance of trauma as a causative factor the author has suggested that diaphragmatic hernias be classified into two main groups: non-traumatic and traumatic. He has subdivided these two groups according to the various types.

In general, the various types of diaphragmatic hernias can be divided clinically into two main classes according to the abdominal viscera which are involved. In the first the stomach is the only abdominal viscus incorporated in the hernia and the hernia usually occurs through the esophageal hiatus. In the second, the intestines (with or without the stomach, and other abdominal viscera are included in the hernia. Such hernias usually are of traumatic origin and are caused by laceration of a normal diaphragm. It also may be of congenital origin and may result from structural deficiency of the diaphragm. Esophageal-hiatus hernia is the most common kind of herniation occurring through the diaphragm that is found among adult persons.

Röntgenography plays an important rôle in the recognition and diagnosis of diaphragmatic hernia. It is also of great value in determining the size and situation of the defect in the diaphragm, considerations which are of aid in deciding upon the method of surgical treatment to be instituted.

Larger types of diaphragmatic hernia, and especially hernias in which a large segment of the stomach or bowel is fixed or incarcerated in the thoracic cavity are strikingly manifest at roentgenological examination, and often the diagnosis is self-evident. However frequently despite pronounced alteration of the thoracic picture the diagnosis can not be established without critical study and small or reducible hernias are likely to escape discovery.

unless the examiner is alert for clues that will stimulate thorough search

Among signs suggestive of hernia that may be elicited during the routine examination of the stomach, displacement of the lower segment of the esophagus is particularly significant and is of common occurrence. In many cases, as the bariumized mixture passes down the gullet, it becomes evident that the lower portion of the esophagus is displaced mesially and that it describes a hook-like curve. In other instances the terminal segment is tortuous but not dilated. In still other cases the segment is angulated. Shortening of the esophagus is noted in the rare instances of congenital shortening. Undue retardation of the barium stream at the hiatus is another potential index of hernia and occurs in many cases.

Scarcely second in importance among signs suggestive of hernia is the observation that the level of the gastric contents is above that of the esophageal aperture.

In 225 cases the patients were treated by radical operation. The herniated abdominal viscera were replaced in the abdomen and the abnormal opening in the diaphragm was repaired. In 133 of these cases the diaphragm was either temporarily or permanently paralyzed preliminary to operative repair of the hernia. In 2 cases it was necessary to perform extrapleural thoracoplasty in addition to the interruption of the phrenic nerve as a preliminary procedure to repair of the hernia. In 223 cases the abdominal approach was employed to repair the hernia, in the remaining 2 cases a combined thoracic and abdominal approach was employed.

In 15 cases it was necessary to perform other operative procedures at the time of repair of the hernia. In 3 cases gastric resection (Polya type)

was done, in 1 case for gastric ulcer at the lesser curvature of the stomach and in 2 cases for carcinoma of the pyloric end of the stomach. In 3 cases posterior gastroenterostomy was performed, in 1 case for high gastric ulcer involving the lower end of the esophagus and in 2 cases for a large duodenal ulcer causing almost complete obstruction of the pyloric end of the stomach. In 5 cases splenectomy was performed. In all of these cases the spleen was firmly adherent to the margins of the opening and to the thoracic side of the diaphragm. Trauma associated with the removal of the spleen from the hernial orifice and the diaphragm necessitated the removal of the spleen in 3 cases, and in 2 cases the spleen was removed because of tuberculosis. In 1 case appendectomy was performed for subacute appendicitis and in 1 case appendicostomy was performed at the time of operation because of obstruction and marked dilatation of the colon.

In 11 cases moderate shortening of the esophagus was associated with the hernia. In 10 of these cases the diaphragm could be sutured entirely above the stomach after the diaphragmatic muscle had been paralyzed by interruption of the phrenic nerve. In 1 case a small portion of the cardia was incorporated in the closure of the hernial orifice.

Twenty-five patients with esophageal-hiatus types of hernia were treated conservatively. In these cases interruption of the left phrenic nerve was done as a palliative or therapeutic measure, in 7 of these cases it was the only procedure contemplated as radical operation was contraindicated, and in the remaining 18 cases the procedure was in the nature of a therapeutic test. It may be necessary to perform radical repair of the hernia in some of these cases at a later date in order to obtain complete relief of symptoms.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Shelley H. J.: Recurrent Inguinal Hernias; A Study of 282 Hernias and 268 Repairs. *Arch. Surg.* 94:4, 1437

This study covered 282 recurrent inguinal hernias of which 268 are repaired. Included are all hernias of this type in patients admitted to the wards of St. Luke's Hospital, New York, from 1926 to 1935 and all repaired between 1926 and 1935 and followed postoperatively for nine months or longer. They comprised 6.4 per cent of all hernias encountered in these two periods and 7.7 per cent of all the inguinal hernias.

Of the 268 hernia repairs, 21 were observed postoperatively for nine months or longer; the average follow-up time was thirty-eight and four-tenths months. Among these are found 39 recurrences, giving a incidence of recurrence of 18.6 per cent. The average postoperative time at which these recurrences are first noted as nineteen and six tenths months. Only 3 (7.7 per cent) recurrences were indirect, and 36 (93 per cent) were direct.

Recurrences followed 14.8 per cent of the repairs of indirect inguinal recurrent hernias done with catgut alone and only 5.9 per cent when fascial suture was used. However four times as many wound infections developed after the use of the latter, 7.6 per cent than when catgut suture material alone was employed, 4.9 per cent. However none of the infections in either instance as followed by recurrence of the hernia.

In the repairs of direct inguinal recurrences, second recurrence appeared after the use of catgut alone in 3 per cent recurrence appeared in only 3.6 per cent when fascial sutures were used. This held true even when the incidence of infected wounds was increased from 2.8 per cent to 6.8 per cent, and 30 per cent of the patients with infected wounds in which fascial sutures were employed had recurrence later.

Among the group of 8 indirect inguinal recurrent hernias which were repaired, patients did not return for follow-up examination. Eleven are observed postoperatively for less than nine months about a recurrence being discovered. Ninety-five patients were followed for nine months or longer or are found to have recurrence within less than nine months.

The average length of time over which 11 followed cases are observed as thirty-four and one-tenth months. The discovered recurrences gave a recurrence rate of 5 per cent. The average follow-up period for those followed nine months or more as thirty-six months. Of this group of 95 repairs recurrences developed in 4 or 6 per cent. The average time postoperatively at which the recurrences are first noted as eighteen and one-half months

Of the recurrences, 90.9 per cent are direct and 9.1 per cent indirect, as compared with the 60 per cent direct and 4 per cent indirect which followed primary repairs of incomplete indirect inguinal hernias.

Of the 54 direct inguinal recurrences studied, 14 are not repaired. Of the 140 patients on whom repairs were performed, 3 died postoperatively and 15 did not return for follow-up examination. Ten repairs were observed for less than nine months without a recurrence being discovered. A total of 5 repairs are followed postoperatively for nine months or longer or until recurrence was noted.

The average time covered by the follow up for the 5 repairs observed postoperatively as thirty-seven and one-half months, and the recurrence rate was 4 per cent. For the 15 repairs observed for nine months or longer or until recurrence was noted, the average follow-up time was forty and four-tenths months, and the recurrence rate was 24.4 per cent. The 23 recurrences were discovered after an average postoperative interval of twenty and six tenths months.

The proportion of direct and indirect recurrences which followed the repair of direct inguinal recurrences as essentially the same for the primary repairs 90 per cent direct and 7 per cent indirect for the former and 90 per cent direct and 9 per cent indirect for the latter.

Various significant points regarding the repair of indirect and of direct recurrent inguinal hernias are discussed together as the recurrences following repairs of these two types of hernias present direct or indirect in essentially the same proportions being predominantly direct in both instances.

Consequently in the repair of either of these two types of recurrent inguinal hernia reconstruction of the floor of the inguinal canal is of primary importance. Careful imbrication of the transversalis fascia, the approximation of the inferior edge of the conjoint tendon to the inguinal ligament appears to be the logical first step in these repairs. This maneuver prevents the insinuation of pieces of peritoneum between the later approximated edges of the conjoint tendon and inguinal ligament.

If the groups of followed cases in this study can be considered sufficiently large for the result recurrence rate to be accurate the conclusion must be drawn that these recurrent inguinal hernias should be repaired by the use of fascial suture. Several authors have in the past few years advocated the substitution of silk suture technique for the use of fascial suture. The data at St. Luke's Hospital there are no records of sufficiently large groups of repairs with dequately long follow-up periods to enable one to draw conclusions on this matter. However until greater numbers of followed cases the repair of which silk sutures are used exclusively

without selection of cases are available for study, the author is of the opinion that the majority of the recurrent inguinal hernias should be repaired with either the McArthur or the Gallie technique, silk being used throughout for sutures, ligatures, and fixation of the fascial sutures.

Factors influencing the general technique of dissection and repair of these hernias are the same as in the repair of the primary inguinal hernias. Among these are careful, clean dissection, maintenance of hemostasis and asepsis, care that sutures are not tied too tightly, inclusion of bleeding vessels only, no adjacent tissues are to be included in the ligatures, and reduction of the size of the cord when necessary at its point of exit through the internal ring.

SAMUEL H. KLEIN, M.D.

Tuovinen, P. I. Azotemia and Hypochloremia in Peritonitis (Ueber die Azotaemie und Hypochloremie bei Peritonitiden). *Acta Soc. med. Fennicae Duodecim*, 1940, Ser. B, 28 Fasc. 3, p. 151.

The author's purpose was to investigate the toxicosis in certain types of peritonitis, especially in dynamic ileus, with the aid of estimations of the sodium chloride and residual nitrogen in the blood. Special attention was paid to the reciprocal relationship between the hypochloremia and the azotemia. The 62 cases examined came from the Surgical Division of the Maria-Krankenhaus at Helsinki. The blood tests were made daily during the critical stage of the disease, as far as possible. The findings are as follows:

In cases of appendicitis peritonitis the toxicosis of peritonitis generally does not appear to be very sensitive to the fluctuation of the sodium chloride in the blood, even in severe cases. The diminution of the salt in the blood is an individual occurrence in a marked degree, and only a continuously low salt content seems to produce a severe disturbance clinically. In case the hypochloremia appears transiently, it occurs during the most critical stage of the disease, the relief of which expresses itself also in a rise of the salt curve nearly to the normal value. On the other hand, however, peritonitis toxicosis is sensitive to azotemia. When the residual nitrogen begins to rise, this should serve as a sign of severe toxicosis. The toxicosis only rarely reveals a correspondence between the rise of the residual nitrogen and a diminution of the sodium chloride value.

The small group of 4 cases of acute appendicitis without peritonitis showed that the postoperative salt and residual nitrogen contents do not change unless the disease is one which acts injuriously upon the intestinal activity or produces such symptoms as liver or renal functional disturbances, which are associated with a change of these values.

In another group there were 6 cases of peritonitis, 2 of which resulted from a perforated gastric ulcer, and 1 from a perforation of the small intestine. In 2 cases there was a streptococcus peritonitis, originating from an incarcerated femoral hernia, and 1 from post-angiose peritonitis which had not been

operated upon. In this group of cases of ileus of various etiology no definite regularity in the reciprocal relationship of the blood salt and residual nitrogen was demonstrable. The residual nitrogen frequently appeared to correspond to the fluctuations of the disease, but not as regularly as in the cases of appendicitis peritonitis. A hypochloremia was not observed in these cases.

The material also included a total of 10 cases of postabortal peritonitis and sepsis. These were clinically severe cases, 6 of which ended fatally. The salt content of the blood in the cases with unfavorable course was not as high as in the cured cases and, therefore, it is impossible to speak of an index of the course of the disease. The loss of sodium chloride possibly lost as a result of vomiting or diarrhea does not express itself as a hypochloremia. The residual nitrogen here again was a sensitive index of the course of the disease, and its increase indicated an unfavorable turn. An intestinal paresis was usually associated with the disease, but a mere septic condition in addition to peritoneal irritation would have been able to produce a manifest azotemia.

There were 7 other genital affections in women not immediately due to abortion. The clinical course of these cases was generally favorable. The sodium chloride value in the different cases showed a varying level, but the variations did not correspond with the clinical condition to any noteworthy degree. The residual nitrogen occasionally showed a slight increase in connection with the aggravation of the clinical symptoms.

For purposes of comparison, 8 cases of mechanical ileus were included. In mechanical ileus the sodium chloride content of the blood does not have any important clinical significance. A loss of sodium chloride from vomiting did not reduce the sodium chloride content of the blood. The residual nitrogen did not correspond to the clinical character of the disease or the toxicosis as it did to the character of the inflammatory diseases in the former group. In case the residual nitrogen began to rise, this was a sign of the severe nature of the disease, regardless of whether the preliminary stage of the disease was short or long. However, even in severe cases it happened that the residual nitrogen was only slightly increased.

The last group of cases consisted of 4 malignant tumors and 1 case of peritonitis suspected of being tuberculous. The sodium chloride value of the blood seemed to be labile, but was irregular in regard to the clinical symptoms. The residual nitrogen was frequently increased, but revealed no such close relationship with the clinical symptoms as in peritonitis. In cases in which peritonitis is associated with a malignant tumor the residual nitrogen usually increases markedly.

The determinations of the sodium chloride and of the residual nitrogen contents of the blood are often of value in the follow-up of the ileus toxicosis and in the choice of the treatment. The importance of the azotemia is particularly great, because from

It prognostic conclusions can be drawn relatively early
 Louis NEWELL M.D.

GASTRO-INTESTINAL TRACT

Reiffert, E. Bacterial Development in the Human Stomach and Its Surgical Significance (Die Keimbildung des menschlichen Magens und ihre chirurgische Bedeutung) *Lang-Bl med. Monatsschr.* 94 5 nos.

We have little accurate knowledge regarding either the bacteria or pathogens in the human stomach. In health and in gastric ulcer few are present. There are more in gastritis and in all cases of retention but especially in cancer before and after operation, they preponderate in the deeper portions of the gut (Hennig). According to the recent literature the decisive factor for bacterial development in the stomach is almost exclusively the degree of hydrochloric-acid production. Hydrochloric-acid deficiency may occur temporarily in excitement or after excessive fatigue. The stomach reflects the life of its bearer more than any other organ (Bayer). These close multifarious relationships become important in the province of gastric surgery. They illustrate, on the one hand, the strict dependence of the bacterial flora on the acid-producing capacity of the stomach, and, on the other, the significance of bacterial growth in certain questions of management and prognosis in surgical diseases. Thus for the first six hours following perforation of a peptic ulcer into the free abdominal cavity the escaped contents are sterile. For this reason individual surgeons have employed hydrochloric acid not only as a harmless but as a biological antiseptic (Loehr). Also the higher mortality of gastric reaction for cancer as compared to that for ulcer may be decreased by gastric lavage with hydrochloric acid for several days preceding operation on the carcinomatous stomach. It has been ascertained that exploratory laparotomy in general entails disturbed wound healing in about 4.5 per cent of cases when, in addition, an ulcerous stomach is opened this increases to 9 per cent, and in the case of carcinoma of the stomach to 4 per cent, not to mention the mortality.

The author concludes that the fact that the kind and the vigor of the bacterial flora in the stomach stand and fall as the mucosa maintains or lacks its capacity to produce hydrochloric acid is significant observation. It appears to be imperative that it should be given more consideration than heretofore in the prognosis and management of gastric surgery (Eugene) JOHN L. LINGGERT M.D.

Benedict, E. B. Indications for Gastroscopy *New England J. Med.* 949, 3 925

Gastroscopy is now generally accepted method of examining the stomach. It bears much the same relation to gastro-enterology that diagnostic cystoscopy bears to urology.

Gastroscopy examination is easily conducted in the outpatient department with the aid of only one

assistant. The technique of local anesthesia is simplified by merely having the patient gargle with 1 per cent solution of pantoicaine. A specially trained head-holder is necessary since the procedure is very satisfactorily carried out with the head resting on small pillows.

The various indications for gastroscopy are discussed and illustrated by case reports. These include gastritis, unexplained gastro-intestinal hemorrhage, so-called gastric neurosis, peptic ulcer, gastric neoplasms, postoperative examination of the stomach, and foreign body in the stomach.

Chronic gastritis is the most common disease of the stomach; it is difficult to diagnose clinically but easy by gastroscopy. Therefore patients with vague gastro-intestinal complaints and negative x-ray findings should have gastroscopic examination. Hemorrhage from gastritis is now well recognized clinical entity. Severe bleeding may come from gastritis alone and may occasionally call for gastric resection. Gastroscopic examination is necessary to establish a positive diagnosis and to follow the course of the disease. The examination should be made within a few days of the bleeding, since otherwise erosions and superficial lacerations which may have been the cause of severe hemorrhage, may have healed completely and the diagnosis will still be in doubt. In some cases of duodenal ulcer with hemorrhage the bleeding may be coming not from the ulcer but from the associated gastritis. The importance of recognizing this is obvious, for if surgery is to be undertaken a knowledge of the degree and extent of the gastritis is essential in order to plan an adequate operation.

A diagnosis of gastric neurosis is not justifiable until gastroscopic examination has ruled out organic disease of the stomach. If chronic gastritis is present it may be the entire cause of the patient's symptoms or at least a major contributing factor. On the other hand, if no lesion is demonstrable either with x-rays or by gastroscopy the patient may rationally be treated for gastric neurosis. Similarly when gastro-intestinal symptoms persist in the presence of negative or inconclusive x-ray examinations gastroscopy may establish positive diagnosis. In fact, no gastro-intestinal study is complete without gastroscopy.

Various problems arise in the diagnosis and treatment of peptic ulcer some of which may be solved by direct inspection of the gastric mucosa. Gastroscopy may reveal one or more gastric lesions not previously suspected. Such an observation will naturally modify the treatment. Direct inspection of an ulcer during treatment will be of assistance in evaluating the progress of the healing process. The demonstration of a severe gastritis in association with either duodenal or gastric ulcer will sometimes modify the treatment and prognosis. The question of cancer is always of great importance in gastric ulcer. By demonstrating that an ulcer has sharp margins and a clean base the gastroscopist can make diagnosis of benign ulcer if the margins are slightly irregular.

SURGERY OF THE ABDOMEN

or the base dirty a diagnosis of cancer must be made. There are, of course, cases in which there will be doubt clinically, roentgenologically, and gastroscopically, such cases must be regarded as cancerous until proved otherwise.

In suspected cancer of the stomach gastroscopy may establish a positive diagnosis. In occasional cases, when other methods of examination have failed, gastroscopy has demonstrated advanced carcinoma. In the differential diagnosis of hypertrophic gastritis, carcinoma, and lymphoma, gastroscopy has been of definite assistance although it has not always given the correct diagnosis.

In cases of postoperative gastritis, jejunal ulcer, or recurrent neoplasm, gastroscopy has given valuable assistance. Postoperative gastritis is a distinct entity, which it is impossible to evaluate or to treat satisfactorily without gastroscopy. Severe cases of this condition with hemorrhage may require further surgery.

In polyposis of the stomach, gastroscopy may differentiate true polyps from enlarged folds or foreign bodies, and in the former will demonstrate the broadness of the base and ulceration of the surface, vital factors in deciding the question as to whether malignant degeneration has occurred.

SAMUEL H. KLEIN, M.D.

Feinberg, B. Salivation in the Course of Intestinal Occlusion (Die Speichelabsonderung bei Darmverschluss [experimentelle Untersuchung]) *Chirurg* 1940, p. 111

"The loss of 'succus' of the digestive tract with the development of 'succus hunger' and the resulting impoverishment of the body in water and chlorides are the causes of acute death in intestinal occlusion or ileus." In the substantiation of this thesis of Samarin, the author has subjected the function of salivary secretion to a searching investigation. The saliva comprises an essential quantum of the total digestive juices (for 1,500 c cm. one-fifth of the total amount), but up to the present time it has been almost disregarded by the medical literature. The problem to be investigated is as follows: After the production of ileus does the secretion of the saliva remain unchanged as to quantity and quality, or not? Is there an interrelationship between the salivation and the content of succus of the organism, which is explained by variations of the salivation, or are other causes at work?

A short description of the investigative technique carried out on 9 dogs is given, the results being illustrated with curves. On each of the first 4 dogs the salivation was first determined in the healthy state, then intestinal occlusion was produced operatively at various levels (duodenum, upper and lower small intestine, colon 50 cm. above the anus) and the salivation was observed until the death of the animal. In the fifth dog the salivation was determined in the fasting animal without the production of ileus. In the sixth to ninth dogs salivation was first determined in the healthy state and then after the pro-

duction of ileus at the same levels as in the first 4 dogs and the animals received subcutaneous injections of physiological saline solution daily (100 c cm. per kgm. of body weight).

Qualitatively no changes were determined. With the decrease in the amount of saliva the increase in nitrogen content is produced by a process of condensation, not by an increased content of mucin. Quantitatively there was a decrease of the salivation immediately following the production of ileus, and the higher the level in the digestive tract at which ileus has been produced the more intense and rapid the decrease. The decrease, even to total absence of salivation, continued until death, which in no case resulted from peritonitis. The period of survival of the animal exhibited a close relationship to the functional activity of the salivary glands, as well as to the functional activity of all the glands engaged in the production of digestive juices. The less the amount of secretion, the shorter was the period of survival.

Fasting, as the cause of the decreased salivation, could be excluded with certainty by study of the fifth dog. The cause must be sought in a disturbance of the fluid circulation in the organism—in the loss of water and salts resulting from the loss of digestive juices. The studies in the sixth, seventh, and eighth dogs substantiate this assumption. The administration of physiological saline solution in the higher dosages of 100 c cm. per kgm. per day was adequate, but the lower dosage of 25 c cm. per kgm. given in the preliminary studies, was found to be wholly inadequate! It was possible to maintain normal salivation, or at least sufficient salivation until death in the 3 animals with ileus in the region of the duodenum and small intestine—therefore, with ileus in the higher reaches of the intestine—and to lengthen the period of survival of the animal markedly, e.g., the experimental animal with ileus in the duodenum lived for twenty-six days while the corresponding animal of the first series studied which received no physiological saline solution lived only seventy hours. Only in the case of the experimental animal with ileus in the colon was there no effect observed, and indeed an effect was hardly expected, since in these cases which naturally run a protracted course, the digestive juices are still absorbed from the entire upper intestinal tract, and the organisms are not depleted of water and salt to the same degree as is the case in those in which the ileus occurs at higher levels.

In conclusion, the author refers to the indisputable possibility of favorably influencing ileus in the human being by the administration of physiological saline solution, if only sufficient quantities be administered. If in the dog 3 liters were necessary to attain the desired effect, according to the experiments, the usual clinical practice of administering from 600 to 800 c cm. subcutaneously or 1 liter by Murphy drip must be designated as a wholly inadequate procedure.

(SCHÖBER) JOHN W. BRENNAN, M.D.

Koerberle F. Diffuse Lipoidosis of the Duodenum (Über diffuse Lipoidose des Duodenums). *Beitr z. path. Anat. u. allg. Path.* 940, 04 455

The author presents 5 cases of xanthoma in the duodenum which has not been previously described. This condition appears to be a lipoid deposition causing in the cases under discussion macroscopic distinctly visible yellow coloration. Microscopically the cells in the depth of the mucosa and in the submucosa have more or less foamy appearance. In polarized light these cells shine brightly and they are filled with lipoid-cholesterol mixture. The author traces the origin of these cells in part from the lymph vessel endothelium and in part from reticular cells and macrophages. He found these changes in 5 per cent of the carefully studied material from 300 cadavers. The changes occurred in cases of gastro-enterostomy gastric carcinoma, and in cholecystitis.

The author connects the changes with an alteration of the chemical reaction in the duodenal bulb due to acidity or to the condition following gastro-enterostomy when the gastric secretion does not reach the duodenum. Evidence of the connection lies in the fact that in these cases the changes occurred only in the cephalad portion of the duodenum nothing is known concerning their pathological significance. (A. BERNI) JOHN L. LUSKETER M.D.

Schmidt, F. C. Primary Adenocarcinoma of the Appendix and Carcinoid Tumors. *Minnesota Med.* 949, 3 79

The author reports the case of a man aged sixty-four who gave a history of acute right lower quadrant pain and anorexia of three days duration. The patient had had an attack of pain in the right lower quadrant of three weeks duration which had subsided spontaneously a year previously. At operation ruptured retrocecal appendix containing an adenocarcinoma in its midportion with perforation of the distal portion was found. Apparently the carcinoma had caused obstruction of the lumen which led to the cut process and rupture with peritonitis. The tumor was adenocarcinoma with gelatinous degeneration. No metastases are noted at operation, but nine months later a hard nodule, sunlike histologically the primary tumor was removed from the scar. Later ascites, abdominal pain, and steady weight loss indicated probable diffuse abdominal metastases. The malignant nature of the lesion was recognized at the original operation and cure was taken to prevent implantation. However the author believes that in the process of rupture dissemination of the carcinoma cells into the peritoneal cavity occurred.

Carcinoma of the appendix diagnosed pre-operatively has not been reported. The symptoms in this condition as well as in carcinoma of the appendix and mucocoele are of recurrent or chronic type and usually it is difficult to attempt to make the diagnosis pre-operatively. The relationship between carcinoma and the argentaffin cells of the Lieber

Kühn crypts has been demonstrated by several investigators. The metastatic possibilities of these tumors have been discussed by Ilavega. A. M. von has named these tumors "endocrine tumors of the appendix" because of the similarity of the types of cells which are present to those of the adrenal cortex and medulla.

The incidence of primary malignant tumors of the appendix varies according to published reports. In large clinics about 1 per cent of the carcinoma of the bowels occur in the appendix. Of all primary malignancies of the appendix, 10 per cent are carcinomas and 90 per cent are carcinoids.

JOHN A. GRAY, M.D.

Worster Drought C., and Shafar J. Observations on Megacolon (Hirschsprung Disease), with Special Reference to an Association with Changes in the Fundus Oculi and Hydrocephalus. *Brit J Child Dis.* 940, 37 55

This article is worthy of careful consideration, and the disease of more extensive study. The authors set forth in this paper:

Examples of an association of megacolon with changes in the fundus oculi.

1. A case of congenital megacolon and congenital hydrocephalus existing in the same individual.

2. The definition of Hirschsprung disease, and various hypotheses regarding the etiology of both megacolon and hydrocephalus.

3. The central control of the functions of the autonomic nervous system.

4. A hypothesis to account for the association of megacolon with hydrocephalus and other disorders of the central nervous system.

LESLIE L. MCCOY M.D.

Shedden, W. M. Cancer of the Rectum and Sigmoid. *New England J Med.* 940, 3 80

Most radical resections of the rectum and sigmoid for carcinoma could be avoided if tumors in this region were seen at the stage of precancer, for it is now the opinion of most writers in this field that the adenoma is the precursor of most cancers of the rectum and sigmoid.

The evolution of the precancerous lesion, as accepted by most authorities, begins with hyperplasia of the mucous membrane at first invisible to the eye, one or more adenomas appear. These adenomas manifest themselves as very slight elevations which become deep red as they grow larger. Then there occurs branching, tree-like processes which ultimately break through of the basement membrane.

During this early stage the patient presents no signs or symptoms. For this reason proctologic endoscopic examination should be part of every routine check-up. If adenomas are found they must be destroyed at the earliest possible moment. The only satisfactory method of dealing with an area of hyperplasia or an adenoma of the rectum or sigmoid is by thorough electrocoagulation or cautery.

via the proctosigmoidoscope. In order to avoid the risk of perforation of the bowel, it is often safer to divide treatment into several sittings.

It is generally agreed that downward lymphatic spread takes place when the lymphatics of the rectum and sigmoid are blocked from above. Glandular metastasis in cancer of the rectum, however, is not necessarily a late phenomenon. The author cites a case in which a small soft tumor was removed widely by electrodesiccation six years ago. The diagnosis was adenocarcinoma, Grade II. The patient was finally persuaded recently to have a radical resection. The specimen showed no trace of the primary tumor, but two small pararectal nodes contained metastases. It is therefore not safe to depend on the criteria of size, soft consistency, and mobility in estimating the malignancy of a rectal tumor.

Biopsy may not lead to true grading of the tumor. Size is not a reliable criterion of operability, fixation to the prostate is as often due to inflammatory reaction as to carcinoma, and mesenteric-node involvement can practically never be determined before operation. There is little relation between the extent of the growth locally and the presence of liver metastases. Dukes' method of grading cancer of the rectum is a satisfactory supplement to that of Broders.

Failure to recognize symptoms, and economic pressure are causes for the high incidence of advanced cancer of the rectum. Another source of error is the high incidence of double rectal conditions, like hemorrhoids or a fistula occurring concomitantly with cancer. The semiannual examination of any large group of adults, especially in the fifty to seventy-year age groups, would well repay the trouble and organization required by the detection of early rectal cancers as well as their precursors, adenomas and papillomas. In order that more early cancers may be discovered, patients must be examined with the finger, sigmoidoscope, and barium enema before symptoms develop.

The Miles operation is the most popular treatment today. With an operability of 75 per cent in most clinics, and a mortality under 10 per cent, the number of cures is about 50 per cent. Most experienced surgeons agree that the only cases in which the use of radium is justified are those in which a small, early tumor cannot be operated upon because of advanced age or concomitant disease.

HAROLD LAUFMAN, M D

Granet, E. Pruritus Ani, The Etiological Factors and Treatment in 100 Cases. *New England J Med*, 1940, 223 1015

Pruritus ani is a symptom resulting from numerous causes, some of them obscure. Obvious causes are dermatological entities, that is mycotic infections, neurodermatitis, lichen planus, psoriasis, ooxuris infestations, and psychoneurosis with anal irritation. Pathological lesions in the lower rectum or anus are responsible wholly or in part for pruritus ani. Among these are redundant prolapsing rectal

mucosa, internal hemorrhoids, proctitis, hypertrophied papillae, cryptitis, fissures, and fistulas. These conditions when found must be eliminated surgically. The concept of pruritus ani as a reflex symptom due to disease in a distant organ is untenable, because it is not supported by satisfactory clinical evidence.

In many cases there appears to be a direct relation between fecal soiling of the perianal skin and the presence of pruritus ani. This is evidenced as a dermatosis induced in the perianal skin by irritant substances in the feces of specifically sensitive (atopic) patients. Evidence favoring this concept exists in studies of the involved skin, which shows changes similar to those found in other types of chemical dermatoses. Positive patch-test reactions to solutions of indole, skatole, and fecal emulsions obtained in some patients with active pruritus ani are further evidence in regard to the cause. It seems likely that constant soiling of the perianal skin with feces is responsible for the recurrences which are so frequent after symptomatic treatment, such as sensory-nerve block by injections of alcohol or anesthetic oils, roentgen-ray therapy, and undercutting operations.

Based on this concept, a routine of management by anal hygiene and medication was instituted in 100 patients with severe pruritus ani. This simple routine of treatment directed toward preventing fecal perianal soiling resulted in subjective and objective improvement ranging from good to excellent in 93 per cent of the 80 patients who followed directions. That fecal soiling is a great factor in the causation of pruritus ani is borne out by the fact that 80 per cent of these patients reported recurrence after an interval of careless anal hygiene or after cessation of treatment. SAMUEL H. KLEIN, M D

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Bisgard, J. D., and Baker, C. P. Studies Relating to the Pathogenesis of Cholecystitis, Cholelithiasis, and Acute Pancreatitis. *Ann Surg*, 1941, 112 1006

The importance of infection in the pathogenesis of cholecystitis and cholelithiasis has been overemphasized. Clinical and experimental data establish that an abnormality in the constituency of bile due to stasis, hepatic damage, the presence of pancreatic ferments, or other factors may cause pathological changes in the wall of the gall bladder and, in turn, these changes alter further the chemistry of the contained bile and result in the precipitation and formation of stones.

Pancreatic juice can pass by reflux into the gall bladder, particularly when the pancreatic duct joins the common duct or shares with it a common opening at the ampulla of Vater. This reflux unquestionably takes place in the presence of obstruction and therefore in conjunction with stasis. The authors report 1 case of a patient who died from total loss of

bile and pancreatic secretion through a cholecysto-cutaneous sinus, and cite cases of acute gangrenous cholecystitis in which there was sterile gall-bladder bile which contained both mylase and trypsin.

Goats were the animals used in these experiments because their gall bladder bile is similar to that of the human being. They develop cholecystitis and gallstones frequently and the anatomy of their duct system is well adapted for this study. I goat the pancreatic duct empties into the common bile duct at a considerable distance proximal to the junction of the common duct with the duodenum and several millimeters distal to the junction of the common and cystic ducts. By obstructing the common duct at two levels (above and below the pancreatic duct) an opportunity was afforded for comparison of the effect upon the gall bladder of stasis alone with that of stasis plus the reflux of pancreatic secretions.

The common duct was obstructed distal to the junction of the pancreatic duct in 5 animals. The obstruction in 7 was permanent and in 8 temporary. In the first group all of the animals died; all of the gall bladders contained pancreatic enzymes, blood, and epithelial debris; 3 were sterile, 5 were gangrenous. The pancreas was unaffected in the older animals, and definitely damaged in the 5 infants. In the second group 3 animals died of acute gangrenous cholecystitis. In 1 of these animals the condition was complicated by acute pancreatitis. Two animals developed a latent stenosis of the distal end of the common duct and their gall bladders contained both pancreatic enzymes and infection. Five goats developed chronic cholecystitis with infection, and in 3, stones formed. In 3 goats, permanent obstruction with cholecystectomy was done. Although pancreatic enzymes traversed 3 of these gall bladders in only 1 was there loss of epithelium and necrosis of the wall, and in this animal the drainage was closed and the obstruction was no longer decompressed. Pancreatic enzymes thus apparently attack only the gall-bladder wall in the presence of stasis or distention.

The common duct was obstructed proximal to the junction of the pancreatic duct and distal to the junction of the cystic duct in 5 goats. One animal had a permanent obstruction, and here stasis plus infection resulted in acute cholecystitis, hepatitis, and multiple liver abscesses, but there was no necrosis of the gall-bladder wall and no pancreatitis. Four goats were subjected to temporary obstruction (stasis of bile without pancreatic reflux). In all but 1 in which partial obstruction persisted the biliary tract returned to normal and pancreatitis did not occur.

It was concluded that neither stasis nor reflux alone was a pathogenic factor but that their combination invariably produced acute aseptic cholecystitis with necrosis of the gall-bladder wall; this was induced chemically and was not the result of infection. Superimposed infection as an important factor in the subsequent development of

chronic cholecystitis. Stones were precipitated by altered chemistry of the bile and the presence of debris. Biliary stasis alone had no destructive action on the gall bladder wall, unless infection supervened. Thus, cholecystitis resulted from stasis plus either the reflux of pancreatic secretion or infection or from a combination of the three factors. The authors believe that these same factors are responsible for chronic cholecystitis in man, after temporary obstruction of the common duct resulting from spasm of the sphincter of Oddi and from reverse peristalsis in the duodenum, in addition to stones or other obstructing factors within the common duct or at the ampulla.

It was assumed that the acute pancreatitis seen in these animals was produced by refluxed bile.

8 LLOYD TITCHELMAN, M.D.

Abell, I. and Abell, I. J. The Question of Drainage Following Cholecystectomy. *Ann. Surg.* 94 15

In a study of the need for drainage following cholecystectomy the authors review a series of 500 consecutive cases of cholecystectomy in the absence of surgery upon other portions of the biliary tract or adjacent organs except coincident removal of the appendix.

It has been their practice to employ drainage in every case showing gangrene, marked pericholecystic edema, inflammation, or obvious demonstrable common duct and pancreatic disease. Spillage of bile from the gall bladder or cystic duct, the presence of bile in the beds of the gall bladder and cystic duct, abnormal relationships of artery, vein, and duct which do not permit satisfactory identification and control, and in the instances in which the separation of pericholecystic abscesses has left appreciable denuded surfaces. The drains employed in the presence of these indications is left in situ for six or seven days. This period of time is sufficiently long to permit of canalization to insure free outflow of bile secretions and discharges.

The ideal cholecystectomy in which the biliary system has eliminated drainage is presented by the case in which the common duct is normal in size and gives no evidence of concretions or periductal inflammation, in which the head of the pancreas shows no increase in size, consistency, in which the relations of the cystic duct of the common duct, and of the cystic artery can be readily defined by dissection, in which satisfactory identification of each and in which the gall bladder can be separated from its bed by sharp dissection without exposure of it or tension. In such instances the cystic duct, with or without the cystic artery if the relations are suitable has been doubly ligated with 1/2 inch chromic catgut ligatures. The connective-tissue bed of the gall bladder is firmly closed by continuous suture of chromic catgut so that no liver tissue is exposed. At times the stump of the cystic duct is covered with peritoneal flaps, but as a rule this feature is omitted with no difference in the convalescence.

the therapy must clearly take the pancreatic lesion into account.

The recurrence of symptoms following cholecystectomy will undoubtedly still plague the patient and surgeon occasionally. This syndrome should however become more and more rare with more and more careful study and a wider selection of cases.

J. M. Mow, M.D.

Malkas, M. Functional Insufficiency of the Sphincter of Oddi (*Die funktionelle Insuffizienz des Sphincter Oddi*) *Chirurg* 940, 396.

In those patients in whom the sphincter of Oddi has been rendered insufficient or has been detached operatively the duodenal content frequently intrudes into the bile passages, and the same is true when abnormal conditions of communication occur spontaneously between the bile passages and the stomach or intestine. The author has had three cases under observation, in which an abnormal communication and destruction of the papilla resulted in an insufficiency of the sphincter with intrusion of the contrast material into the finest branches of the bile passages, during fluoroscopy of the stomach. The patient had a chronic intermittent arteriovenous fistula occlusion at the duodenojejunal flexure. Three months later although the dilatation of the duodenum as still present the bile passages were no longer visible. The cause of the abnormality could not be determined at operation.

Six similar cases are abstracted from the literature and 5 more are cited. Likewise, those cases of gas-filling of the bile passages without previous operation discharge of tone which may be considered instances of insufficiency of the sphincter are but rarely reported in the literature. The truly primary insufficiencies of the sphincter of Oddi have never been found except a chance observation in fluoroscopy of the stomach.

The author assumes the cause of sphincter incompetence to be increase in the intraduodenal pressure dilatation of the duodenum with distention of the papilla and tone of the sphincter parasympathetic following cholecystectomy. Weakness of the sphincter in cases of duodenal ulcer apparently because of edema of the duodenal wall, and tone of the sphincter in cases of pancreatitis the papillary edema. It is certain that nervous influences of unknown character also play a role. Active treatment is not demanded solely because of the ingress of duodenal content into the bile passages.

(Storck) JOHN W. BARR, M.D.

Mitrani, P. L. Anatomicofunctional Disturbances of the Sphincter of Oddi (*Anatomisch-funktionelle Störungen des Sphincter Oddi*) *Chirurg* 940, 378.

The author mentions Rost's experimental demonstration of incompetence in 97% of mucular hypertrophy of the sphincter following cholecystectomy. The observations of Del Valle (p. 35) who showed an actual narrowing of the papilla lumen in

cooperation following cholecystectomy and finally the work of Westphal, Gleichmann, and Mann in 93 who, experimenting with pharmacodynamic substances and faradic current, were thereby able to differentiate an upper astatic, vagotonic portion and lower sympathotonic portion of the sphincter. The author himself calls attention to the fact that in the same period he has observed three static disturbances by means of operative cholangiography.

After discussion of the nature of inflammation of the sphincter of Oddi he discusses hypertrophy of the sphincter which, as is well known, develops after cholecystectomy. Hypertrophy however is by no means the only cause of the resisting or obstructing papilla. Pronounced hypertrophy of the sphincter occurs with dilatation of the biliary duct corresponding to the hypertrophy of the cardia or sphincter of the esophagus or rectal enlargement, respectively. There is also permanent anatomical factor namely an increase in the contractile substance which usually causes an increased tone for the most part dependent spasm. There is then self-maintaining obstacle to the uppermost end of the sphincter of Oddi, the existence of which can only exceptionally be discovered at autopsy yet most certainly it is present during life.

The author assumes that dyscinesia, an expression of disturbed function has its basis in partial contractions initiated through the sympathotonic portion of the sphincter which are also responsible for the reflux of bile into the duct of Wirsung. This can be demonstrated by operative cholangiography. If the width, form and course of the hepatobiliary duct permit, one can also visualize by operative cholangiography the nature of the inflammation which is causing stenosis of the sphincter of Oddi.

Especially significant the question as to whether or not unbinding or stationary condition is present because the following rule for management may be laid down: persistent inflammation of the sphincter of Oddi makes drainage operation absolutely necessary. Roentgen films of operative cholangiography which accompany the original rule permit recognition of the various conditions.

(Storck) JOHN L. LAKE, M.D.

MISCELLANEOUS

Rippy, E. L. Perforating Gunshot Wounds of the Abdomen. *J. Am. Med. Assn.* 940, 576.

Rippy presents a study of 29 cases of gunshot wound of the abdomen. Of the 24 patients in whom exploration was not done 3 (95.8 per cent) died. However among 263 cases in which exploration was done there were 66 deaths, a mortality of 6.9 per cent. This report considers only those cases in which there were visceral perforations.

It has been repeatedly said that the smaller the caliber of the rifle or pistol the lower the mortality and this is confirmed in Rippy's study.

The age incidence showed that the greatest number of cases occurred between the ages of twenty-one

and thirty The mortality increased steadily with the decades of life. The mortality in the colored race was 62.3 per cent as contrasted with 68.8 per cent in the white race, and the mortality in the female was 61.2 per cent as against 65.4 per cent in the male.

Rippy believes that x-ray examination should be discouraged as a routine procedure because of the imposed pre-operative delay and the added moving and handling of patients. The earlier the operation, the greater was the chance of recovery.

As shown by others, this study reveals that the amount of hemorrhage is the greatest single factor in the determination of the mortality. Transfusions were given from one to ten times in 99 of the patients. Results showed that in those who received blood the mortality was 8 per cent lower than in those who did not.

The second most important factor in the death rate is the organ, or organs, perforated. The mortality increases when more than one organ is perforated, as the number of holes and the degree of destruction of the organs increase, and as the site of perforation descends in the intestinal tract.

From the standpoint of surgery, simple closure is recommended for perforation. Resection is associated with a high mortality. Ether was the anesthetic of choice because it gave the required relaxation and was not associated with very much shock. The mortality decreased as the length of time required for the operation increased. This was due in part to the fact that the hasty operator is more likely to overlook perforations.

The vast majority of deaths occurred within twenty-four hours. Rippy arbitrarily classed the deaths which occurred within twenty-four hours as being caused by shock and hemorrhage (59.8 per cent), and those which occurred after twenty-four hours as being due to peritonitis or some cause other than shock.

In an effort to lower the mortality figure, the promptness of preparation for operation, choice of anesthetic, operative technique, length of the procedure, and pre operative and postoperative management are all considered as important factors that are under the surgeon's control.

EARL GARSIDE, M.D.

GYNECOLOGY

UTERUS

Kidd, L. S.: A Consideration of Some Problems Associated with Carcinoma of the Cervix. *Australasian & New Zealand J Surg* 1949, 3.

In this report the author gives consideration to several selected aspects of the position of surgery in the treatment of carcinoma of the cervix. The Commonwealth Department of Health in Australia issues an annual review of results obtained by various methods. The only conclusion from this review is that the highest percentage of cures was produced by the combination of surgery and radium. Radium alone, however, was the method selected for the treatment of the greatest number of patients. A comparison of the results is dependent upon the interpretation of the intrapelvic and vaginal conditions by the clinician at the first examination. On this interpretation depends the classification with the associated percentage of success or failure.

Of operable cases in which enlarged glands are present in the broad ligaments, 57 per cent are not malignant. Because of complicating sepsis, they may be firm, fibrotic, and surrounded by a suggestive hardness, which is difficult to differentiate from malignant invasion by palpation. Calcified and tuberculous glands may appear in this vicinity.

In 10 per cent of cases of carcinoma of the cervix there is an associated endometriosis of the lymph glands; the glands are of stony hardness and densely adherent to the surrounding structures, but they react in pleasuring to radiation.

Only when the combined method of surgery and radium is employed is it possible to evaluate these factors, the exploration revealing the exact state of affairs in the pelvis. The statistics of this technique besides being the best, are the only reliable ones because they are based on a correct interpretation after direct inspection.

When radiotherapy is used alone, an opinion should not be recorded until retrospectively interpretation has been made after the infected malignant ulceration on the portio vaginalis has healed. The success of radium treatment depends upon a lethal dose of x-rays penetrating the whole field of invasion, as evenly as possible from the cervix to the extreme edge of the lymphatic spread.

After the use of radium in the cervix, it is the practice of the author to open the abdomen eight weeks later in suitable cases; panhysterectomy is performed. The broad ligaments are split open and the peritoneum is lifted off the iliac vessels. The glands which are not firmly fixed are removed, but the lymphatic bed is disturbed as little as possible. The field is now ready for the implantation of radon. The author describes this procedure in detail.

He notes that on results will be satisfactory until it is universally recognized that the earliest phases

of this disease give no warning symptoms and only trivial signs. The disease must be diagnosed by careful inspection, early biopsy and iodine testing. When it is either in the latest stationary precancerous stage or when it presents the small localized malignant plaque described by Schiller.

THOMAS F. THURSTON, M.D.

Rasmussen, M. and Tarpelsen, E.: The Fiber Cell Structure of Carcinoma of the Uterine Body (Ueber das feinere Zellstrukturael bei Carcinoma Corporis Uteri). *Acta Soc med Fennicae Scandinavica* 1949, Ser B, 50 Fasc. p. 64.

The authors have studied the cell structure of cases of carcinoma of the uterine body, paying special attention to the microstroma, the silver impregnated parts, and the chondrosomes, and using the old classification of denonations and solid carcinomas. They state that their observations do not justify their treating their results as those of different groups, and therefore they present them simply under the term of carcinoma of the uterine body.

The form and size of the tumor cells showed great variations. Compared to the cells of the normal, simple-layer glandular epithelium, those of the simple-layer epithelium and of the epithelial islands are generally smaller and their form is not cylindrical, but cubical or quite irregular. On the other hand, most of the nuclei are of the same size or larger than those of normal epithelium and their form was round or oval in the few anaplastic cells found, but assumed practically any aspect (round, elongated, cornered, partly constricted, angula) in medullary carcinoma. The microstroma as regularly observed in preparations stained with Heidenhain iron hematoxylin, even when the nucleus is already badly altered. It is usually found at the apical pole of the cell and was surrounded by a clear round halo when it was near the nucleus, the surrounding cellular plasma did not show the halo, but was often darker than in the remaining parts of the cell. The microstroma contained mostly centrioles, which touched one another with their base and formed diplostroma. The centrioles could not be demonstrated with the staining method used. In the anaplastic epithelial cells, there were always microstroma with more than two centrioles, which seemed to occur in pairs and were grouped without arrangement in number of cases. A microstroma with more than two centrioles did not show halo. The centrioles are usually of the same size and form.

Silver impregnated parts are relatively scarce and, although some impregnated particles are found in practically every preparation, they are not as observed in only one half of the cases. The coils are sharply delimited; they are small groups of threads stained black with pleated border.

ders, often they appeared not to lie in the same plane as the nuclei, but they were usually close to them, two coils could be found in some cells and one was then on the side of the basal membrane, in general, they lay toward the lumen. Silver-stained chondrosome particles and rods were present in all preparations, generally at the borders of the cells and in the vicinity of the lumen.

The chondrosomes were best stained by Altmann-Kull's method, but the staining could not be too prolonged. Their form varied greatly, but they appeared mostly as punctiform granules and thread-like structures. In some cells, they showed as fine, serpentine threads directed longitudinally; their length was from one-third to one-fourth that of the cell and they lay close to the nucleus or in the border portions of the plasma without any special arrangement. The number of threads varied and at times they filled the entire cell. Some chondrosomes presented relatively large granules and short rods and the granules were often grouped around the nucleus. The chondrosomes were scarcest in the anaplastic tumor cells and often consisted of very small dots in some of these cells there were also very fine threads.

RICHARD KEMEL, M D

Turunen, A. Investigations on the Histological Structure and the Cell Structure of the Secondary Ovarian Carcinomas, Some Clinical Observations (Untersuchungen ueber den histologischen Bau und die Zellstrukturen der sekundären Ovarialkarzinome nebst einigen Beobachtungen ueber deren Klinik.) *Acta Soc. med. Fennicae Duodecim*, 1940, Ser B, 28, Fasc 3, p 99.

Secondary carcinoma of the ovary is no histologically uniform type of tumor. It should be considered as a combination tumor, formed in one part from the metastatic carcinomatous epithelium and, in the other, from the tumor stroma produced by the proliferation of the ovarian stroma. In the superficial parts of the tumor one often sees normal ovarian tissue with follicles and corpora lutea. The peculiar histological structure of this tumor depends mostly upon the independent proliferative property of its stroma tissue and also upon the intracellular and intercellular collection of mucoid substance of epithelial origin in this tissue.

The epithelial cells of the tumors are in general similar to the epithelial cells of the primary carcinoma in that the more anaplastic the epithelium of the primary tumor, the further removed is also the epithelium of the ovarian metastasis from the cylindrical epithelium. Nevertheless, in certain cases, in which very little adenomatous structure could be found, the ovarian metastasis was almost generally adenomatous.

In the ovarian metastases the anaplastic epithelial cells were poorer in cytoplasm, and in them there were more abundant regressive changes, especially vacuolization and mucoid metamorphosis, than in the cells of the primary carcinoma. There were no giant cells in the metastatic tumors, although

they were found to some extent in the primary tumors. The less anaplastic cells, still showing the cylindrical form of the adenomatous secondary carcinoma, were mostly of the same type as the cells of the primary carcinoma.

Signet-ring cells could not be found in the primary tumors studied by the author, but they appeared in more than half of the metastatic ovarian tumors, the largest number were found in the most anaplastic tumors and the smallest number in the adenocarcinomatous tumors. The successive development of the signet-ring cells from the small epithelial cells poor in cytoplasm could be followed, so that the epithelial origin of these cells is certain. In these one could always obtain a positive reaction with mucicarmine and determine how their content emptied itself into the intercellular tissue. In the mucoid unchanged portion there was a granulation, and with certain tinctorial methods a distinctly reticular structure could be demonstrated. The spherical formations in the nodal points of the reticulum did not appear with the chondrosome staining, but the reticulum appeared partially with the employment of silver impregnation methods.

The collagenic connective tissue of the metastatic ovarian tumors in the more anaplastic tumors in the region of the epithelial islands is a dense and, in the intermediate areas, a slightly reticular felting. In the adenomatous tumors the tubular glands were usually lined with a membrana propria. Except in 1 case, the stroma tissue in them was generally more compact than in the previous cases. In the former there is also found between the connective-tissue fibrils, abundant intercellular substance reacting positively to mucoid reagents, in the latter it is more sparse. Elastic fibers are few, they are preferentially in the capsule.

The stroma tissue of the tumor often proliferates markedly at the edges of the smaller epithelial islands, and one can then observe in these islands an epithelial cell degeneration and disappearance of the cells. As a result of the latter, tissue which suggests a reticular fatty tissue extracted with fat-dissolving substances occasionally appears in large areas. In places the stroma proliferation forms fairly complete epithelial-free tumor areas of the type of a loose fibroma. The mesenchymal cells in general show the type of the resting fibroblasts, and more rarely are found in the stimulative state. The sarcoma cells do not contain any stroma, nor do the mesenchymal cells show any mucoid changes.

The abundant mucoid substance in the tumor is of epithelial origin and in places controls the histological picture completely. According to the author's opinion, the rapid growth of these tumors in most cases depends largely upon the accumulation of mucoid substance in the tumor and, therefore, not upon the fact that the ovary presents especially favorable conditions of growth to the cancer cells. The mucoid substance also fills the deeper or superficial cystic cavities produced by the necrosis in the tumor.

Eradic cells are found in the metastatic ovarian tumors much less often than in the primary tumors. The former reveal chiefly mast cells and lymphocytes. In the primary tumors abundant plasma cells as well as neutrophilic granulocytes also appear. Undoubtedly the greater frequency of the inflammatory cells in the primary tumors depends upon a bacterial infection, which is not present in the metastatic tumors.

The finer structures are almost the same in the metastatic and the primary tumors. The microcentrum of the epithelial cells was almost regularly formed by two centrioles, only rarely by three. The cells which retained their cylindrical form, it was situated at an oblique angle with the longitudinal axis of the cell. In the slender ring cells it was located in the end of the cells opposite the nuclei or in the lateral parts of the cells, far removed from the nuclei.

The chondrosomes were spherical, sometimes rod shaped, and their localization corresponded with the plasma network. The surroundings of the nucleus and of the microcentrum are free from chondrosomes, as are also the ends of the cylindrical cells turned toward the glandular tube. The chondrosomes of the primary tumors were of the same type as those of the ovarian metastases.

The internal reticular apparatus appears in its most developed form in the cylindrical epithelial cells of the adenomatous tubes and lies at the end of the tubes directed toward the glandular lumen, very near the cilia. The more primitive the glandular tubes the more irregular appeared the apparatus in relationship to the glandular lumen, and the more anaplastic the cells the more independent was the apparatus in regard to its form. The apparatus of the primary tumors was of the same type as that of the secondary tumors.

In the material studied, 6 patients were operated upon radically, both the primary carcinoma and the secondary ovarian carcinomas being removed. Of these, 3 patients are still free from a recurrence after 1 years of observation and 3 lived for two years and nine months after the operation and died from metastasis in the bowels. Only in 1 case was a local recurrence found in the pelvis. Most of the patients died from the primary tumor or its local recurrence. It is possible, therefore, to achieve permanent cure in the cases in which the primary tumor is removed radically and the ovarian metastases resected in time. The liver and para-aortic glands were found normal in almost all of the cases. LOWEN ARTHUR, M.D.

The majority of ovarian tumors store very little iodine. The degree of iodine storage does not parallel morphological changes.

The fact that some ovarian tumors can produce malignant metastases makes it imperative that careful study of the abdominal cavity be done at the time of operation and that bone surveys be made at least once thereafter. It is possible at times to remove part of the metastases safely particularly when the condition gives rise to thyrotoxic disturbances, or when bone implantation has occurred. From 5 to 6 per cent of these tumors produce metastases, and half of the latter kill by malignant invasion. LOWEN ARTHUR, M.D.

TREITS P. Concerning 2 Cases of Theca-Cell Tumors as the Cause of Postclimacteric Bleeding (Ueber zwei Fälle von Thekazellennomen als Ursache postclimakterischer Blutungen). *Zentralblatt Gynaek.* 1940, p. 877.

Endometrial hyperplasia is a frequent finding in the climacteric, although in the postclimacteric period the endometrium is generally atrophic. The cause of the hyperplasia is a pathological increase of the follicular hormone. In the postclimacteric individual an ovarian tumor should be suspected as the source of the increased hormone production.

Granulosa-cell tumors and theca-cell tumors belong to the group of ovarian tumors which produce follicular hormone. The theca-cell tumor is less frequently observed than the granulosa-cell tumor, only 33 cases having been cited in the literature. The author reports 2 new cases observed by him in 2 patients, both sixty-four years old. Both patients were admitted to the clinic because of bleeding. At operation in each case only a small, yellow tumor the size of a hazelnut, as found in an ovary. Histologically these tumors showed the structure of a theca-cell tumor. The uterine mucosa, as always in these cases, was frankly hyperplastic. In 1 case the proliferation of the mucosa was so intense that it had formed so-called proliferation cysts, and the possibility of malignant degeneration had to be considered. In such cases it is recommended that the uterus together with the adnexa be removed, even if the cytological findings are negative.

(N. 12) RÖHLER R. G. M. D.

MARTZOFF, K. H. Primary Cancer of the Fallopian Tube. *Am J Obst & Gynec.* 1940, 4: 804.

A case is reported of primary carcinoma of the fallopian tube which tentatively diagnosed before operation. The patient is alive and well five years after operation. Since preparation of this paper the patient has developed cervical lymphadenopathy on the left side. Tissue removed for biopsy revealed an obvious metastatic carcinoma. The symptoms and signs of this comparatively rare disease are obtained from the literature are so protean and in general so similar to other types of diurnal disease that there is little logical basis for suspecting its existence.

ADNEAL AND PERIUTERINE CONDITIONS

EMGE L. A. Functional and Growth Characteristics of Struma Ovarii. *Am J Obst & Gynec.* 1940, 40: 735.

From 5 to 6 per cent of ovarian struma produce the most characteristic morphological changes do not necessarily parallel the degree of toxicosis.

A tentative diagnosis of primary carcinoma of the fallopian tube, however, can logically be considered in that limited group of patients who present the syndrome of hydrosalpinx with a sero-sanguineous vaginal discharge but no causative vaginal or uterine pathology. Hysterosalpingography should have a definite place in the establishment of a provisional clinical diagnosis, especially if palpable pelvic abnormality is not demonstrable. The high degree of malignancy of this disease, as generally stated in the literature, is in some instances probably more apparent than real when one considers as in the case herein reported the long duration of the disease before operation. The use of high voltage roentgen ray therapy is recommended by numerous authors. However, there is at the present time no suitable information available that indicates its value in the treatment of the disease.

In the discussion RUTIN stated that 1 case of primary carcinoma of the fallopian tube and 1 secondary case were encountered in 110 cases of carcinoma of the female genital tract. The case is reported in detail. EDWARD I. CORNELL, M.D.

EXTERNAL GENITALIA

Taussig, F. J. Cancer of the Vulva. *Am. J. Obst. & Gynec.*, 1940, 40, 764.

Early recognition and prompt adequate treatment are extremely rare in cancer of the vulva. In spite of this the disease, because of its relatively slow growth, offers a reasonably good prognosis. Prevention of carcinoma of the vulva by early excision of the leucoplastic vulva should materially lower the incidence of the disease. Roentgenological treatment of the disease gives disappointing results, and is usually attended by painful burns. The complete modified Basset operation gives splendid results in patients with operable lesions (Clinical Groups 1 to 3) who are under sixty-five years of age. In older patients only those in better than average physical condition with relatively early lesions should be subjected to this procedure. Approximately two thirds of the cases of cancer of the vulva are still operable at the first examination. In those in whom a Basset operation is done we can expect a five-year survival in about 3 of 5 (58.5 per cent), even though 2 of 5 (41 per cent) already show evidence of lymph gland metastasis. EDWARD I. CORNELL, M.D.

Cosble, W. G. Carcinoma of the Vulva. *Canadian M. Ass. J.*, 1940, 43, 439.

The author reports his findings in a study of 59 patients who have been treated for carcinoma of the vulva in the Toronto General Hospital and the Ontario Institute of Radiotherapy, Toronto, since 1929. Fifty-six had squamous cell carcinoma, 2 had melanotic carcinoma, and 1 had carcinoma of Bartholin's gland. Carcinoma of the vulva is a disease of later life, the oldest patient was seventy-nine, and the youngest forty-one, the average age being sixty-two years.

Pruritus vulva was the most common symptom. Other complaints included pain in the vulva, lump in the vulva, ulceration of the vulva, tenderness at the time of urination, bleeding, and discharge.

The most frequent location was in the greater labium where the growth started as a surface plaque or nodule, later underwent superficial ulceration, and gradually invaded and became fixed to underlying structures. The lesser labium was the next most frequent site and the majority of the tumors which involved the clitoris originated where the labia formed the prepuce. Involvement of the vestibule seemed to result from spread of the tumor. The more extensive cancers showed a destruction of tissue and were accompanied by excruciating ulcerations. The inguinal lymph nodes were frequently enlarged. However, in one third of the patients in whom such nodes were palpable, it was proved microscopically that this was due to infection, and not to cancer.

Twenty-one patients had leucoplastic vulva. All of this group suffered from pruritus or vulval pain.

The diagnosis of carcinoma of the vulva is not difficult. However, only 25 patients presented themselves within one year after the onset of symptoms. It appears that elderly women are prone to delay seeking advice through fear, modesty, or ignorance. Twenty-seven patients had had symptoms for more than two years, and 8 others had known of painless nodules in the vulva for from two to ten years.

The cases of melanotic carcinoma and Bartholin-gland cancer are reported in detail. One of the patients with melanotic cancer died within a year, and the other one succumbed after seven months. The patient with cancer of the Bartholin gland died six years after operation.

This study emphasizes the insidiousness of carcinoma of the vulva. Local recurrences may appear years after irradiation treatment. Gland involvement has been observed as late as ten years after an operation which consisted of vulvectomy and incomplete gland excision.

Radical vulvectomy is the treatment of choice for cancer of the vulva although the age and physical state of the patient may influence the decision regarding appropriate management for individual cases. The radical operation is not attended by the degree of shock which might be expected. "After removal of the vulva a bilateral gland excision is performed. A semilunar incision is made from the anterior superior iliac spine to the pubic spine and is carried down to the superficial fascia. The gland-bearing fatty tissue of Scarpa's triangle is removed *en bloc*. The long saphenous vein is ligated and cut at the apex of the triangle and the whole mass of tissue is reflected to clear the fascia lata and clearly expose the fossa ovalis. The saphenous vein is ligated and cut where it enters the femoral vein, and the femoral canal is cleared of all fatty tissue, thus removing the highest lymph node of the chain—the gland of Cloquet."

These 59 cases were divided according to the type of treatment received—(1) irradiation, (2) surgery,

(3) irradiation followed by surgery and (4) surgery followed by irradiation. Nineteen patients have been subjected to radical operation 68 per cent of them are living. Neglect of symptoms results in an unacceptably high percentage of advanced cases. Radical vulvectomy offers a hopeful prognosis, but simple vulvectomy and indifferent gland excision are not recommended if one expects to cure many cancers of the vulva. Radiotherapy is of value in the treatment of elderly patients.

Grosz H. Gubner, M.D.

MISCELLANEOUS

Stallworthy J. An Investigation into the Result of Operation in Genital Prolapse. *J. Obst. & Gynaec. Brit. Emp.* 940, 47, 39.

The aim in the treatment of prolapse is to leave the vagina as normal as possible in length, diameter and mobility. Only when this aim is achieved can the operation be considered perfectly successful.

The records of 488 operations for prolapse performed by 8 gynecological surgeons at the Chelsea Hospital for Women are studied. The technique of the operation varied with the individual surgeon. The longest interval between the times of operation and examination was ten years and the shortest was two years. Two hundred and sixty-eight patients on whom 285 operations had been performed are interviewed and examined. The author includes in this series of genital prolapse cases of vaginal wall prolapse, as well as cases of true procidentia. On 77 occasions, constituting 63 per cent of the series, a combined anterior and posterior wall repair was performed. A posterior wall repair alone was required on 78 occasions as compared with the 100 which an anterior wall repair was necessary.

Prolapse recurred in 3 per cent, one fifth of these cases occurring after parturition. There was no recurrence in 58 per cent of the patients who became pregnant after operation and who were delivered vaginally. Sixteen failures are due to the development of a cystocele, urethrocele, or both combined. Ten failures were due to the development of a rectocele. The shortest time in which symptoms recurred was immediately after the patient left the hospital and the longest as eight years after operation.

Dyspareunia complained of after operation by 5 per cent of all the patients, and was permanent in 1 per cent. In patients definite mechanical cause was found as follows: stenosed introitus, 5; generalized vaginal stenosis, tender stricture in the vagina, tender perineal scar, retroverted tender uterus, and senile vaginitis. In the remaining 6 patients the cause of the dyspareunia was probably functional. The necessity for arming patients of possible initial difficulty in intercourse after vaginal plastic operation is emphasized.

Stress incontinence as the most common complication, and occurred 43 times, or in 6 per cent of the series. In 3 the incontinence troublesome only at intervals. The occurrence or persistence of

stress incontinence after prolapse operation is due to faulty technique in not extending the anterior colporrhaphy sufficiently far down the vaginal wall to permit adequate support of the urethra itself.

A recurrent sensation of something dropping as complained of by 16 patients. No signs of prolapse were found in 4. In 9 cases, symptoms were due to weakness in vaginal wall reported to be normal at the primary operation, which consisted of the repair of one vaginal wall only. In 6 cases second operation was necessary to repair the subsequent prolapse of the opposite wall. In 5 cases this was the anterior wall and in 1 the posterior. These results indicate the importance of making certain that there is no weakness of the opposite wall before a single colporrhaphy is performed. There is risk in approximately 6 per cent of trouble occurring later because of prolapse of the remaining wall.

During the years from which this series was collected 1,300 consecutive repair operations were performed with 1 death, a mortality of 0.8 per cent. The most common cause of death was myocardial failure (4 cases). Three of the deaths are due to infection. The importance of making careful examination of the cardiovascular system in every patient before finally giving surgical treatment for prolapse is evident.

D. W. G. Morrow, M.D.

Effermann G., and Wario, E. The Importance of Histamine Metabolism in the Pregnant and Non-Pregnant Female Organism. (Die Bedeutung des Histaminstoffwechsels im weiblichen schwangeren und nichtschwangeren Organismus.) *Arch. f. Gynak.* 924, 70, 22.

The facts which appear to make the histamine metabolism of functional importance for the female genital organs during or in the absence of pregnancy are surveyed. The present investigations record high histamine content of the normal non-pregnant uterus of human beings and animals. The blood of pregnant women as found to possess disproportionately high capacity to split up histamine.

This is based upon the presence of histaminase in the blood. This increased capacity of histaminase detoxication in the blood is specific in pregnancy. The histamine content of maternal blood is at the lowest level of the norm during pregnancy. In the term muscle itself histaminase is not found or it is as it is only of low activity. In the fetal blood circulation the placenta showed strong histaminase activity. Its histamine content was particularly low. Histaminase in the blood of the newborn as not increased, but the fetal metabolism caused histamine to be liberated in larger amount and it appeared in higher quantity in the blood of the newborn. Only after section of the placenta did the histaminase spread rapidly into the surrounding placental blood. The importance of the increased histamine metabolism lies, first of all, in the effect of histamine which regulates the vascular system and increases permeability. It is assumed that the histamine stored in the pregnant uterus plays part

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Young, J. Relaxation of the Pelvic Joint. In *Pregnancy; Pelvic Arthropathy of Pregnancy*. J. Obst. & Gynec. Brit. Emp. 94: 47-493.

Previous investigations have shown that pregnancy leads to a relaxation of the pubic joint which is reflected in an increase in the gap between the pubic bones. In some cases the gap is so great that it must be regarded as pathological. The widening commences some time in the first half of pregnancy and, in general, does not progress during the last two months. It is not increased by labor. The width of the gap diminishes after labor and approaches the pre-pregnant measurement by the end of the third to the sixth month. There is some evidence of similar change in the sacro-iliac joint, but the anatomy of this joint makes it less amenable to accurate study. Some investigations carried out suggest the possibility of hormonal basis.

The present evidence indicates that the degree of widening is on the average so meager that it can at the most have only a minor influence on the process of labor. The physiological softening of the joints may however facilitate the labor process in two different ways—by expansion of the pelvic space and by allowing rotary movement of the iliac bones. When the rotation is forward, it leads to an increase in the anteroposterior diameter of the brim, and when in the opposite direction to an increase in the teroposterior diameter at the outlet. The passage of the fetus itself helps to induce these favorable rotatory movements. Roentgenographic experiments in the Walcher position indicated that no appreciable increase in the anteroposterior diameter of the inlet resulted from it.

The disabilities arising from excessive relaxation of the pelvic joints during pregnancy fall under two headings: (a) those dependent upon an excessive mobility both of the sacro-iliac and the pubic joints and (b) those dependent upon an excessive mobility of the sacro-iliac joint alone. Pubo-sacro-iliac arthropathy occurred 34 times in a successive series of 45 pregnant women, that is 75 per cent. The investigations throw no light on the influence, if any, of age on the incidence of the condition. The average date of onset was the twenty-sixth week of pregnancy, the earliest date being the eighth week and the latest the thirty-sixth week. 3 patients were primigravidas and 9 were parous. The severity of the symptoms and signs is related to the degree of mobility which occurs in the loosened joint. The degree of the up-and-down gliding movement of the pubic joint can best be detected by roentgenography with the patient standing first on one leg and then on the other. In selected cases, the marked symptoms the movement usually easily detect.

Displacement of the pubic joint whether widening or gliding is correlated exactly with and is dependent exactly on, the degree of movement of the sacro-iliac joint on one or both sides. The degree of widening of the joints does not bear a direct relation to the risk of disability however. Routine examination of the pelvis for different purposes has revealed relatively wide separation without any clinical evidence whatever.

Trauma, of even trivial nature, may precipitate the disability in an acute and critical form. In 5 of 34 cases there was such history. A certain proportion of patients had their symptoms from the trauma of labor but rupture of the pubic joint during labor is extremely rare. This may occur especially in difficult and instrumental deliveries when the descending child pushes or drags down with it the two innominate bones, and causes them to rotate forcibly at their sacral articulations. Because of the trifling nature of the trauma in some cases, one must conclude that instances of this kind must involve joints which are damaged or are vulnerable because of lowering of the tone of the surrounding muscles. This is supported by the fact that in 3 of the 34 cases the women were found to be suffering from some co-existing morbid process which by general lowering of the health and the consequent reduction in the muscle and ligamentous tone unbalances the protective control of already weakened joints. The influence of postural strains incidental to pregnancy cannot be stated definitely, but it is the author's opinion that the standard of muscle tone is the paramount consideration.

While marked rocking of the superincumbent spine at one or both sacro-iliac joint is present in all cases of pelvic arthropathy in pregnancy it is not often possible to obtain evidence of this by either direct or x-ray examination of the joint.

The majority of the men exhibit the same basic clinical features namely pain and tenderness in the pubic and sacro-iliac regions which first appear usually about the fourth or seventh month of pregnancy. Occasionally backache may be present. The symptoms generally develop gradually and the beginning the patient is conscious of the discomfort only on walking or during any exertion. The symptoms may appear suddenly and cut in however. After sudden strain or accident walking or even standing may become impossible. In the majority of the cases there is an infection of the gait. In the milder cases there is a lump on one side while in the more severe cases the patient may exhibit all the marked double tenderness on pressure over the pubic joint is one of the most characteristic physical signs. In addition there is tenderness on pressure over the affected sacro-iliac joint, and in some cases, there is pain and tenderness over the region of the sacrospinous ligament.

The author believes that many women who develop backache some weeks or even one or two months after childbirth owe their disability to the damage of the pelvic girdle sustained during pregnancy or, in rare instances, during labor. Of the 30 women followed up after labor, backache of clinical importance was present in 14 or 46.6 per cent.

A larger group is represented by those with sacro iliac arthropathy alone. This gives backache during pregnancy. However, it is only very rarely that we can substantiate this diagnosis by demonstrating, either by direct examination or by radiology, any evidence of displacement or movement at the joints, although it is the author's belief that in the large majority of cases of pregnancy-backache the symptoms and signs point clearly to sacro iliac strain.

The treatment depends upon the severity of the symptoms. In the less marked cases the provision of a strong corset with curtailment of active exertion is sufficient. This should be continued for several months after the birth of the child. For all severe cases, complete rest in bed is the best treatment. After seven or ten days of such treatment the relief is usually well maintained if a corset is fitted before the patient gets up.

In the worst cases, about 1 in 10 of the total, the placing of the patient in a sling similar to that used for cases of fractured pelvis is essential. Massage, the application of radiant heat, and graduated exercises are all of value. The management of the patient during labor is important, especially during anesthesia, when the patient is unable to protect herself by the voluntary control of her muscles. Therefore, the pelvis should be supported at this time.

Under ordinary conditions, the pelvic joints, which are relaxed during pregnancy, lose their mobility within a few months after childbirth. It is possible that in those women whose symptoms persist this excessive mobilization persists in so far as the sacro iliac system is concerned.

For chronic low backache of this type, manipulation has given the author better results than any other method of treatment. Twenty-five successive crises have been so treated. In all, the backache was traced to pregnancy or childbirth and there was no evidence of any other etiological factors. The method employed was that described by Bankart, in which manipulative movements directed to the forcible flexion of the lumbar spine and pelvis, forcible rotation of the sacro iliac joint, and forcible extension of the lumbar spine and pelvis are carried out under anesthesia. In 17 of 25, or 68 per cent of the cases, the patients obtained complete relief from the backache. In the majority of successful cases the relief is immediate and sometimes astonishing.

DANIEL G. MORTON, M.D.

Nemec, E. Ovarian Pregnancy (Eierstockschwangerschaft). *Bratislav lek listy*, 1940, 20: 210.

Ovarian pregnancy occurs very rarely. Benecke described 100 cases prior to 1923 and Neumann

described at least 40 more in 1932. The author's case was that of a twenty-seven-year-old married woman who had been sterile for six years. At laparotomy an ovary as large as a plum was found on the left side, and on that side of the abdomen was a 5 mm opening from which villi protruded. Sections of this ovary revealed, beside the shell-like invaginated corpus luteum, an adjacent hematoma as large as a hazelnut with a pale membrane and chorionic villi. Microscopically, the hilus was hyperemic. In the ovary itself there were corpora albicantia and several atrophic follicles. The corpus luteum was markedly developed, its cells were exceptionally large, and the protoplasm was abundant revealing numerous yellow droplets. It was enveloped by connective-tissue fibers in which numerous blood vessels were found. Above this was a coagulum similar to the thrombus usually seen in the corpus luteum of pregnancy. In it were chorionic villi which penetrated the cortex and the corpus luteum in a stellate manner. In the ovarian stroma were larger blood vessels, into the walls of which chorionic villi had penetrated. Decidua or decidual reaction could not be recognized in the stroma although infiltrating chorionic villi were also present there.

The signs which are required by Leopold and Werth for confirmation of the diagnosis of ovarian pregnancy (free tubes and fimbria, and connection of the ovary by means of the ovarian ligament proper with the uterus and broad ligament on one side and by means of the infundibulopelvic ligament with the pelvic wall on the other side) could be determined beyond any question of doubt in the author's case.

Ovarian pregnancy can arise either on the surface (epi-ovarian) or within the follicles. Several opinions on this question were investigated (Seliga, Franz, Schikele, Benecke, Buettner, Hoehne, Kermauner, H. Kleine, and others). In the epi-ovarian pregnancy there is no spatial relationship with the corpus luteum, whereas in the intra-ovarian pregnancy the ovum lies in it. Several authors who deal with this question are mentioned (Miller, Millew, Kerrow, and others). Hoehne and Kermauner are cited in connection with intrafollicular pregnancy. The American investigators explain ovarian pregnancy on the basis of the Sampson theory (Webster, Lulle, Sutton). A case of ovarian pregnancy was observed by Brouha and Robinson, the fetus was aborted by the traumatic action of an intra-uterine iodine injection. Some older opinions on this question are cited, those of Poorten and Opitz, as well as some of the newer opinions of R. Meyer, Caffier, Seliga, and others.

The author considered his case to be an intrafollicular pregnancy because of the condition of the corpus luteum. In one place the lutein cell layer was very thinned out and in the neighborhood of the rupture it was lacking entirely. Such a condition is characterized by Miller as representing intrafollicular pregnancy. The treatment is always operative. (VLJKA JANISCH-RAŠKOVIC) EDWARD W. GIBBS, M.D.

Oberst, F. W. and Plase, E. D. Calcium, Phosphorus, and Nitrogen Metabolism in Women During the Second Half of Pregnancy and in Early Lactation. *Am J Clin & Nutr* 940, 4, 309.

It was the purpose of this study to determine the calcium, phosphorus, and nitrogen metabolism in pregnant women under dietary conditions which at the present time, are believed to be nearly ideal for the growth and development of the fetus without depletion of the maternal organism of these elements.

A series of ten-day calcium, phosphorus, and nitrogen balance experiments were made on 5 women between the twenty-first and the fortieth weeks of pregnancy. Three of these women were also studied during early lactation. The experiment was planned to obtain the maximum retention of calcium, phosphorus, and nitrogen during pregnancy. The results indicate that this end was accomplished. The daily calcium intake for the various subjects during pregnancy ranged from 1.63 to 1.64 gm and the daily retention, from 0.3 to .88 gm. The calcium intake in 4 metabolic balances during lactation varied from .9 to 1.8 gm, with retentions varying from .6 to .5 gm per day. The subjects with the highest milk excretion had the lowest retention. The daily phosphorus intakes during pregnancy ranged from .41 to 1.0 with retention from .022 to 0.68 gm. The daily phosphorus intakes in four periods during early lactation in 3 women ranged from 1.59 to .95 and the retentions from -.08 to 0 gm. The negative balances shown by women occurred shortly after parturition. The daily nitrogen intakes in 5 pregnant women ranged from 9.99 to 15.5 with retentions from -.077 to 3.65 gm. The negative balance appeared in a subject who was ill during the collection period. The total nitrogen intake during early lactation ranged from .6 to 6.8 gm, per day. The ten-day collection periods during the first and second weeks of the puerperium gave negative balances. Two other periods, one in the third and one in the fifth and sixth weeks of the puerperium, showed definitely positive balances.

Throughout the metabolic studies, the condition of the teeth was carefully observed since each subject had caries on admission. Periodic examinations of the teeth are made by dental surgeons. In no case did new dental caries develop. In one case there was complete arrest of decay for the period of the study and consistent improvement in the teeth of all subjects was noted over the entire period of observation.

EDWARD L. CORVELL, M.D.

Cope, C. L. Diagnostic Value of Pregnanediol Excretion in Pregnancy Disorders. *Brit M J* 940, 545.

Employing Venning's method of estimation of pregnanediol, Cope of Oxford, reports analyses of twenty-four human urine specimens obtained from women of pregnancy of which about 75 were seriously

abnormal. Pregnanediol is found in the urine only during the luteal phase of normal menstruation, or when placenta is actively functioning. In normal menstruation maximal excretion of pregnanediol occurs usually from five to seven days prior to the onset of bleeding. It disappears before bleeding starts unless pregnancy occurs. The daily excretion of pregnanediol is small during the first few weeks of pregnancy. It increases gradually, reaching its height in the eighth and ninth months and falls to zero a few days after delivery. There is a wide normal variation in the daily amount of pregnanediol excreted.

Demonstration of pregnanediol in the urine in case of amenorrhoea is regarded as strongly suggestive of pregnancy. Conversely, absence of the substance from the urine of a woman with recent amenorrhoea usually means that she is not pregnant. In regard to threatened abortion, Cope states that if pregnanediol is persistently absent in two or more determinations, this is very suggestive of one of three possibilities: (1) abortion is inevitable; (2) the products of conception have been already partially or completely evacuated; or (3) the fetus has died without expulsion and produced condition of missed abortion. Pregnanediol assays of great exact value when intra-uterine death of the fetus is clinically suspected. Absence of pregnanediol provides strong support for the diagnosis.

The significance of low pregnanediol excretion still remains uncertain. A normal excretion does not preclude the occurrence of abortion nor does it denote a living fetus. Chronic nephritis and toxemia of pregnancy may both interfere with the excretion of pregnanediol. The author aims that the significance of pregnanediol values can be outlined only broadly at the present time.

WILL ED G. FRAYER, M.D.

Terdavert, H. The Frequency and the Therapy of Placenta Previa, Including Local Statistics from Finland from 1923 to 1932 and the Clinical Material from the Helsinki University Women's Clinic from 1925 to 1936 (Zur Frequenz und Therapie der Placenta Praevia—Eine Landesstatistik aus Finnland, 9 3, 93, mit einem klinischen Material aus der Univ. Frauenklinik zu Helsinki, 9 5, 936). *Acta Soc Med Fennicae* *Dissertatio* 940, Ser. B, 5, Hæc.

The author quotes interesting material of statistics covering results obtained in Denmark and in Finland in cases of placenta previa treated by abdominal section, mifepruon, rupture of the bag of waters, and version. He stresses repeatedly that all cases of placenta previa should be hospitalized before hemorrhage or infection occurs. Even though labor at home treated expectantly or the rupture of the bag of waters appears to proceed satisfactorily in placenta previa one never knows when the case may become surgical or even because of dangerous hemorrhages. In difficult cases of the kind delivered at home the percentage of maternal mortality is very high. Those patients taken to hos-

pitals showed a lower death rate, but too many were brought in too late. First, the patient herself awaited the cessation of her hemorrhage, next, the midwife waited for the same, and, finally, the doctor waited. After all this waiting, hospitalization naturally did not show a satisfactory percentage of lives which were saved.

If circumstances require delivery of a case of placenta previa at home, early rupture of the bag of waters will help to expedite delivery and to reduce maternal mortality. If one is attempting to control the hemorrhage by tampons, and, if at the same time, the pressure against the cervical ganglia by the child's head increases the labor activities, the Willett-Gauss scalp forceps are of great service and often may replace version. If a version is done to stop hemorrhage in cases treated at home, the obstetrician should not attempt immediate extraction, this conservative method is indicated to avoid delivery before the proper cervical dilatation has taken place.

If the fetal life is in danger in total placenta previa, it is better to proceed by the extraplacental route than to perforate the placenta to reach the fetus. If the hemorrhage ceases, there is no urgent need for manual separation of the placenta, but if the mother is very anemic from the loss of blood and hemorrhage starts again, and if the Credé method fails, a manual procedure to deliver the placenta is in order. For mild cases, even in the clinic, the author advises rupture of the bag of waters. However, to avoid long delays in delivery and to circumvent continuous or recurring hemorrhage, the author finds it expedient to use the Willett-Gauss forceps, as no appreciable harm need be sustained to the living child by this method.

If the fetus is dead, the Clinic resorts to the classical therapy of placenta previa, this is version, which nearly always stops the hemorrhage.

The dangers of accouchement forcé in placenta previa were empirically so well defined, even before the era of cesarean-section, that forced dilatation of the cervix and extraction of the fetus cannot be recommended.

There are times when cervical dilatation has progressed so far that an experienced obstetrician can aid in a rapid delivery after version with the expectation of a living child. Otherwise, it must be admitted that with the exception of favorable results following rupture of the bag of waters, abdominal section, if conscientiously performed, is the only method that safeguards the life of the mother and the child.

The infant mortality could be reduced materially if the patient came for treatment in the hospital early instead of waiting for an ominous hemorrhage. If, after an accurate diagnosis (eventually also including a roentgen picture), one considers rupture of the bag of waters insufficient to expedite labor, then a cesarean section should be done in the interest of both the mother and child, even before a vaginal examination is made.

If the mother is anemic a blood transfusion should be given.

Haugh of Denmark and Olow of Sweden are the only authors who presented reports of important examinations of large numbers of placenta previa cases. The author lists similar studies of statistics from Finland from 1923 to 1932, which include 1,498 cases of placenta previa. The frequency of this complication during those years is equal to 0.195 per cent (1 in 514). His research shows that there is a general increase in the number of cases of placenta previa cases, this is also proved by the statistics of the government, which have shown a definite increase since the beginning of the first decade of the twentieth century. This increase is due undoubtedly to the increase in the number of inflammatory diseases of the female genital organs just as this seems also to be the cause of the increase in tubal pregnancies.

In Finland about 56 per cent of the cases of placenta previa were delivered in hospitals. Those treated at home were for the most part less complicated cases with a maternal mortality of about 4 per cent, the institutional maternal mortality was about 6 per cent. The difficult cases treated at home showed a maternal mortality of about 10 per cent, while those treated in the hospital showed a mortality of about 8 per cent. The infant mortality of the cases treated at home was about 75 per cent, that of the hospital cases, about 43 per cent. The number of deaths due to infection was four times less than the number due to hemorrhages.

A comparison of the placenta-previa treatment prevailing in Denmark with that of Finland, with 14 per cent and 8.2 per cent maternal death rates respectively, leaves little doubt that the more frequent abdominal sections done in Finland account for the better results.

The author's conclusion is that if a case of placenta previa does not proceed with the labor after rupture of the bag of waters, abdominal section is the only method that will safeguard the mother and the child. The many complications of pregnancy and labor in the presence of placenta previa make individualization of the treatment obligatory.

MATHIAS J. SEIFERT, M.D.

Aigner, K. The Frequency of Fetal Malformations in Conjunction with Placenta Previa (Die Häufigkeit der fetalen Missbildungen in Verbindung mit Placenta praevia). *Zentralbl. f. Gynäk.*, 1940, p. 884.

The author quotes J. P. Greenhill's statement to the effect that fetal malformations are found much more often in connection with placenta previa than in cases not complicated by a low lying placenta, and with the evidence of 241,580 deliveries made at various institutions, among which there were 2,040 cases of placenta previa with 18 malformations he tests Greenhill's conclusion. Greenhill found a very high percentage of deformities in cases of placenta previa.

This comparatively high frequency of malformations in placenta previa might have the practical implication that the greatest conservatism should be practiced.

The author studied the cause of placenta previa and quoted all hitherto known theories. Some authors look for the biological mechanism in the fertilized egg itself, others in the uterus, still others believe that placenta previa arises from delayed ripening of the egg. From the researches of Poot as the cause of placenta previa lies in the anatomically underdeveloped poorly functioning endometrium. It is striking that placenta previa chiefly affects multiparas in whom the repeatedly functioning gravid endometrium is exercised and fatigued because of pregnancies following in rapid succession (Panko). A placenta previa can also arise when implantation is successful in the face of conditions unfavorable to development. Placenta previa can generally be regarded as a complication of multiparity. An observation of Pankow shows that women in whom menstruation and ovulation have started late probably show greater proclivity to the formation of placenta previa.

The author first divides fetal deformities into 4 groups: (1) those that occur because of faulty development (stunting of growth), and (2) those that arise from overdevelopment (doubling of parts); he then redivides them into two other groups: (3) those which arise from the structural, abnormal, hereditary properties of the germ cell, and (4) those which represent secondary phenomena of disturbances of development.

The author enters into particulars of the causative developmental defects and reviews the results of experimental work to date. Fetal malformations can be precipitated by exogenous or endogenous factors. In this connection reference is made to the animal experiments in which malformations occurred. Among the endogenous factors, over-eating and over-producing ranked high. A rôle in fetal malformation is also played by disturbances in the hormonal pattern. Murphy concluded that most deformities depend upon damage to the germ-plasm. The author on the basis of his researches, finally came to the conclusion, as other authors have that miscarriages occur no more often in placenta previa than in cases with a normal placenta. He believes he can explain the variations between his results and Greenhill's on the ground that Greenhill arrived at his conclusions through a extremely irregular method and interpretation of data. Also, the author is not of the opinion that the cause of placenta previa and of malformations is generally the same. Exogenous influences very often instigate placenta previa, but it is difficult to prove exogenous influences to be the cause of malformations. Primary endogenous damage of the germ-plasm, in all events, plays a major rôle. Because of the fact that the frequency of malformations is not found to be greater in placenta previa deliveries than in normal deliveries, there ceases to be any question whether this has any

practical significance. It is rather the delivery itself that is to be handled conservatively because of the fetal malformation. A common cause for placenta previa and fetal malformation has not been proved.

(RUDOLF HILLMAYER) RICHARD WARRIN, M.D.

Westman, A. Pernicious Vomiting of Pregnancy (If pernicious gra idarum) *Archiv f gynec Scand* 1940, 20, 203.

During the period from January 1935 to December 31, 1938 there were 66 cases of hyperemesis gravidarum, or 0.78 per cent of all the deliveries seen at the Women's Clinic at Lund, Sweden during that time. Four patients had severe toxic symptoms, 9 had severe vomiting and pronounced vasomotor disturbances, 38 complained of severe vomiting only and 5 had less severe vomiting bordering on emesis gravidarum. Two of the 4 severely toxic women died. The aetiological findings were very slight. In toxic cases, Westman's clinic recommends induced abortion. In the other groups treatment consisted mainly of withholding food, dextrose drop infusions, and insulin injections later supplemented by mouth. Most of these patients who were checked for prolan elimination showed an increased urine prolan level. There was no relation between the severity of the hyperemesis and the prolan level.

In the discussion of this paper and papers by Brandström, Schmitt-Rasmussen, and Wetterdal, ANDERSSON stated that he never had death from pernicious vomiting of pregnancy nor had he ever induced an abortion for this condition. He uses psychotherapy together with mild sedatives. His treatment consists of exercise and coercion and of educating the patient to resist her vomiting reflexes. He does not keep his patients in bed. He places himself in the line of fire so that the patient could vomit at him, thus compelling her not to vomit. After a vomiting he forces patient to eat solids immediately again.

ANDERSSON discussed the hormonal aspects and reported his researches, though not final as yet should be read in the original by those interested in this aspect of the question.

OSLOW reported that he had to perform operations three times to induce abortion in 37 patients with pernicious vomiting of pregnancy. 11 patients who died (not of this series) there was emesis of the vomiting *sub articulo mortis*. His attempts with Vitamin B are as yet conclusive.

HALL recommended treatment by complete isolation, enforced by withholding of mail and information, that isolation should continue until vomiting stops. Along the same line of mental coercion, castor oil is used, it is repeated on repetition of the vomiting. Besides sedatives he gives from 3 to 4 drops of ephedrine 0.005, three times daily.

SEVER stated that there is a very marked irregularity in the incidence of fatal hyperemesis from 1906 to 1939 there were 115 cases in his institution about 20,000 admissions and deliveries of pregnant women.

without any death from hyperemesis, from 1921 to 1928, there were about 11,000 admissions with 5 deaths from hyperemesis, and from 1928 to 1939 there were about 22,000 admissions, again with no deaths from vomiting of pregnancy. He cannot explain this variation, but he compares it to similarly unexplained variations in mortality from eclampsia.

HEINRICH LAMM, M D

Mudaliar, A L, Nayar, A S M, and Menon, M K K. Eclampsia, A Clinical and Biochemical Study. *J Obst & Gynaec Brit Emp*, 1940, 47, 404

Biochemical investigations were carried out on 64 patients with eclampsia, on 103 with normal pregnancy of various durations, and on 12 normal non-pregnant women. The results are given in graphic form. The cases of eclampsia were divided into the renal, hepatic, and fatal types.

The average blood sugar in the normal pregnant woman, as has been shown before, is 64.48 mgm per cent. In the hepatic and renal types of eclampsia the blood sugar was within normal limits, but in the fatal cases of eclampsia it was 59.6 mgm per cent, a definite hypoglycemia. Therefore, insulin treatment is contraindicated. On the other hand, intravenous glucose therapy in these cases is now coming to the front more and more. A definite increase of the total sodium and potassium in the blood was found, so that one should think twice before large doses of alkalis are administered to eclamptic patients.

The serum magnesium in normal pregnancies was 1.51 mgm per cent. In the fatal cases of eclampsia, it was 4.5. On the basis of these findings, one wonders whether magnesium sulfate should be used so indiscriminately. It would probably be best to restrict its use to those cases in which the magnesium is within normal limits.

An excess of phosphates was found, while the blood calcium was within normal limits. The diminished calcium phosphorus ratio seemed to be of some prognostic significance. No conclusion could be drawn from the blood cholesterol studies. A definite chloride retention was observed in the hepatic and renal types of eclampsia. Therefore, restriction of salt is considered advisable.

There seemed to be some retention of urea in the renal and fatal cases of eclampsia. The uric acid values were high in the fatal cases. All investigators are agreed that a rise in the uric-acid content is of bad prognostic significance.

An average of 12.9 mgm per cent of creatinine was found in the fatal cases, while the average for normal pregnancy was 2.89 mgm per cent. An increase of blood creatinine is of very grave significance.

It was concluded that

1. Hepatic eclampsia is rare, but it is fatal much more frequently than the other varieties.

2. Hypoglycemia is marked in the fatal cases, which suggests intravenous glucose therapy.

3. An increase of inorganic phosphorus, uric acid, creatinine, or of magnesium is of grave prognostic significance.

4. There is an increase of total bases in the blood and so alkalis should be carefully administered.

5. Hepatic eclampsia differs from the renal type in that there is an increase of magnesium, phosphorus, cholesterol, and uric acid with a practically normal blood-urea content and urea clearance.

6. The urea clearance is very much diminished in the fatal and renal types of eclampsia.

DANIEL G. MORTON, M D

Rauramo, M. The Etiology and Treatment of Deflected Positions—a Critical Investigation Based upon the Author's Own Cases (Ueber die Aetologie und Behandlung der Deflexionslagen—Kritische Untersuchung auf Grund eines eigenen Materials). *Acta Soc. med. Fennicae Duodecim*, 1940, Ser. B, 29, Fasc. 1, p. 1.

The author claims that the presentations of the anterior cephalic portion of the head, the forehead, and the chin at labor are the main problems of the European obstetricians. The descriptions of these positions are of historic interest and cover a period of years from 1100 A.D. to date. Many and varied designations have been applied to abnormalities of fetal positions during all these years. In the statistics found in the literature, these positions are classified and discussed separately by eminent obstetricians and even by some prominent midwives. Some of the latter are credited with surprisingly accurate descriptions of abnormal positions as well as commended for their treatments to overcome these abnormalities.

After giving about 40 pages of tables of births with all particulars included, such as age of the mother, number of children she bore, duration of labor, and time at which the bag of waters ruptured, the author states his conclusions. He gives a brief synopsis of the history that made known the abnormalities of the different groups of deflected positions, and reports certain theories covering the etiology of these positions as adopted at present. These theories are at great variance in many essential points etiologically, especially in the group of anterior cephalic positions, which are poorly explained. The author briefly states the prevalent treatment of deflected positions. The universal treatment of these deflections, including the chin presentations, is to adopt the expectant and watchful waiting procedure as far as possible in order to encourage spontaneous delivery or at least a delivery per vias naturales.

The many poor results of treatment should have led to certain therapeutic improvements in the interest of the babies. This has not happened even though the surgical technique has made immense progress. It is generally admitted that forehead and face presentations are often found concomitantly with contracted pelvis. The author stresses the fact that in the general discussions of deflections only

certain features were noted, even though different grades of abnormal positions were obviously present; therefore, it was impossible to formulate tentative conclusions on the problem. Comparing the different grades of deflections, etiologically and therapeutically on the basis of the various material presented, with each other as well as with a entire group of deflections, the results of false deductions are easily accounted for. Accordingly the author believes it is indicated that the earlier results should be eliminated from the standpoint of etiology therapy, and a final outcome of the treatments.

For this study he presents many statistics of his on 266 cases of deflection and of the comparatively few cases mentioned in the literature. Among the entire 135 deflections there were 69 anterior cephalic presentations (in 30 primiparas (49 per cent), 3 forehead presentations, in 54 primiparas (44 per cent) and 303 face presentations in 65 primiparas, (49 per cent). A deflected position often results in forehead presentation when the soft part offer great resistance, and in face presentation when the soft parts offer less resistance.

As to age 44.3 per cent of the primiparas of twenty-four years and younger and 50.4 per cent of the older mothers showed deflections.

A contracted pelvis caused 5 per cent of all the deflections in the author's own cases.

Babies weighing between 3,000 and 4,500 gm. are more frequently found in deflected positions than the smaller babies.

Twins in deflected positions were present in 4.6 per cent of all the hospital material.

Babies with an exaggerated fronto-occipital circumference cause more deflections than those of average measurements.

Sex apparently makes no difference in the occurrence of abnormal positions.

Congenital diseases, tumors, and anomalies of the extremities or of the cord seldom cause deflections.

The causative factors of deflected positions are apparently similar in all groups of deflections. In the different groups and in the different cases these factors may operate separately or jointly in producing various degrees of similar abnormalities; therefore, the classification in daily practice would be better designated as Deflected Positions I and II with 3 grades of modification.

Pyeloc kidneys are present in 40 per cent of all the author's cases and in about 30 per cent of all their institutional cases. These kidney positions are due to constitutional infirmities, extremely hard muscular and overactive occupations, or protracted partus with long and severe labor pain. Much affected the entire circulatory system (all may have been influenced by contracted pelvis).

The therapy in Vilpuri is much different today from that in former years—there are many more surgical deliveries. The author describes the technique of his section caesarea lithomicalis and stresses that even though the corpus uteri remains intact the incision is smaller the danger of adhesions is less,

the infection and thromboses are fewer the risk of rupture of the uterus in subsequent labors is minimal, and the healing process is rapid.

Ranzano is of the opinion that all cases of deflection should be considered as one group for judging or comparing the treatment when the final results are obtained otherwise the conclusions may easily be erroneous. Finally, he decided early section caesarea lithomicalis is indicated, as the prognosis for mother and child is thereby greatly enhanced.

MILWAUKEE J. SERRAVALLO M.D.

LABOR AND ITS COMPLICATIONS

VARTANO, T. Hematomas of the Vagina and Vulva in Connection with Labor (Ueber Vagina- und Vulva-haematome im Zusammenhang mit der Geburt). *Acta Soc. med. Fennicae Duodecim* = 540 Ser. B. 23 Fasc. 3-4.

Effusions of blood into the thesae arise generally as result of an unusual trauma mostly from the effect of direct force, and in women this is usually the process of labor, which makes great demands on the elasticity and firmness of the pelvic organ and thesae.

In the literature, the frequency of the occurrence of these hematomas varies between 1,000 and 6,000. In primiparas hematomas occur three times as often as in multiparas.

Characteristic of these hematomas is their tendency to be restricted anatomically to certain areas filled with loose connective tissue and surrounded by firmer tissue and to follow the direction of least resistance. Consequently most of the investigators divide the hematomas into those lying above and those lying below the musculo-fascial plate. Those above arise between the rectum and the vagina or between the cervix and the bladder respectively between the leaves of the round and broad ligaments. Below the plate the hematomas spread into the thesae of the vulva, the lower portion of the vagina, or into the ischio-rectal fossa. The pelvic fascia serves as the limit, part which they generally do not spread. Only rarely when there is great tissue destruction or especially marked hemorrhage, can the hemorrhage break through to spread into the upper tissues up to the subcutaneous tissue. The hematomas spreading upward may extend laterally toward the iliac fossa and then along the musculature point the region of the diaphragm. Usually they are unilateral very rarely they spread through the endocervical or the rectovaginal septum to the other side. Those arising below the pelvic floor generally do not spread so far but they rupture. They may reach considerable size even that of man's head, but usually they are much smaller fist-sized nodes, which fill the labia minora and majora into single masses or protrude through the anterior or lateral wall of the vagina into or out of the vulva. They are much more often on the left side than on the right and this has been attributed to the asymmetry of the pelvic veins, as result of which the veins on the left side contain more blood.

The most usual and striking symptom is pain, which is burning, cutting, or cramplike. Often the pains occur at intervals like labor pains and give a feeling of fullness in the pelvis. This symptom is especially characteristic for hematomas lying above the pelvic floor, in which cases an external swelling is often absent. Other neighboring viscera may also show signs of compression, such as urinary retention or strangury, swelling and bluish discoloration of the external genitalia from circulatory disturbance, and displacement of the uterus from the median line. Large hematomas may be associated with anemia as a result of the hemorrhage, which may rapidly become serious. If the effusion of blood spreads above the musculofascial plate, the picture may closely resemble that of an intra abdominal hemorrhage.

The loosening of the tissues occurring in pregnancy is apparently a factor favoring the spread of a hematoma, but the opinions on the cause of the bleeding vary considerably. The various causes reported in the literature include a ruptured artery, and a torn varicose dilated vein, but most investigators consider the rupture of one of the larger blood vessels as the most common cause of hematomas. Either an accidental or individual weakness of the vascular wall is the most common prerequisite of a vascular lesion. Congenital or hereditary "inferiority" of the circulatory system, cavernous dilatations of the veins, varicosities, aneurysms of the uterine artery, nutritional disturbances of the blood vessels, and toxic injuries of the blood vessels have been considered responsible. All factors that increase the venous pressure are undoubtedly of special significance in the explanation of the genesis of hematomas. These include coughing, defecation, lifting heavy objects, and, especially, the powerful straining in labor. Another factor cited is the stasis of blood in the veins produced by the fetal head, this applies particularly to primiparas, in whom the collaterals of the venous system have not developed sufficiently.

The purely mechanical factors include the vaginal wall following the fetal head during the expulsive phase and its resultant separation from its substratum. A markedly anteriorly flexed uterus stretches the posterior vaginal wall during labor pains, resulting in hemorrhage before the head has reached this level. In protracted labor the fetal head produces a necrosis through pressure on the vascular wall, the separation of which causes bleeding. During an exceptionally rapid labor the tissues do not have time to stretch sufficiently, which results in a vascular rupture and a hematoma, especially when the pains and straining have been particularly severe.

Pelvic anomalies may also be a factor, especially the generally contracted pelvis with the attendant greater tissue tension, more marked compression, protracted labor, and numerous operative interventions. Forceps deliveries and versions may serve as trauma for weak vascular systems and lead to rupture. Anomalous positions of the fetus are frequent causes of hematomas.

Because of the fact that hematomas only exceptionally occur in successive deliveries, it may be concluded that no one constant factor is the main cause, or is alone decisive for the development of hematomas, but that the accidental factors are equally important. There are many causes and only when these concur in the same case do they produce hemorrhage into the tissues.

A hematoma rarely appears during the first stage of labor. Such an early appearance may constitute a serious obstruction to labor if the formation develops to large dimensions rapidly. Generally the hematoma appears only in or after the second stage and therefore does not interfere with labor itself. Hematomas have been reported as occurring relatively late in the puerperium.

Slight effusions of blood are usually resorbed within a few days without noteworthy injury. With large hematomas there is always the danger of hemorrhage and infection as a result of their rupture or, if they remain intact and circumscribed, the possibility of infection via the blood or lymphatic systems. Even if uninfected, an extensive hematoma may become a disturbing factor because of the resulting persistent and uninterrupted pain, or the hematoma may make the puerperal recovery more difficult mechanically by preventing the escape of lochia because of plugging of the vagina, thereby producing even severe symptoms of infection in the uterus.

The causes of death from hematoma are either the result of bleeding or infection. The prognosis depends essentially upon the extent of the hematoma, with small hematomas it is usually good. No definite conclusion can be drawn regarding the hematomas located above the musculofascial plate of the pelvis, as they may spread rapidly upward, but yet the hemorrhage may be so great as to cause death in a short time. If the hematoma ruptures externally, it may result in severe hemorrhage, which may persist and cause death in spite of packing and suture. Sepsis is extremely rarely a cause of death. The most serious and frequent cause of death is pulmonary embolism.

The prophylaxis is especially difficult because of the uncertain cause and the rarity of the hematoma. Rapid delivery must be avoided whenever dilatations of veins are observed. During all operative interventions crushing of the tissues should be avoided.

The treatment also depends upon the extent and localization of the hematoma. Small effusions of blood appearing after labor, which show no tendency to spread, require no operative measures, but a repetition of the hemorrhage should be avoided. For this absolute rest and an ice cap, cold compresses, or lead water compresses are indicated. When the danger of extension is past, moist warm compresses and diathermy are used. If fever occurs later and an infection of the hematoma is suspected small hematomas are incised. The methods of treating larger hematomas vary considerably. When

the hematoma present signs of either extension or has opened externally spontaneously. It is best to open the wound widely and carefully set the cavity so as to avoid secondary hemorrhage and infection. This is best done in hospital as the finding of bleeding vessel may be very difficult. The procedure should never be considered slight or simple. An early incision is the surest means of relieving the pain and effecting rapid cure. Hematoma localized above the musculo-sclerotic plate must always be treated surgically. For a very extensive hematoma and difficultly controlled hemorrhage laparotomy is advised. When the hematoma appears early during labor the latter should be completed rapidly and carefully with forceps. If the hematoma is so large that the passage of the head is possible only by the use of great force and extensive tissue destruction is inevitable, preliminary wide opening is recommended because in this way smooth wound surfaces are obtained and the after treatment is facilitated. When hematoma threatens to form an obstruction for the placenta, the latter must be removed manually. Credé compression should be avoided because this maneuver can easily spread the effusion of blood. In fresh cases with intact walls either conservative treatment or the incision, emptying and closure of the cavity should be chosen. The incision should be made on the third or fourth day after the appearance of the hematoma because the danger of secondary hemorrhage is then lessened. LOUIS HUNTER, M.D.

Fitzgerald, J. E., and Webster, A. The Effect of Vitamin K Administered to Patients in Labor. *Am. J. Obs. & Gynec.*, 1940, 40: 43.

A series of cases has been studied in an effort to determine the effect of Vitamin K administered to women in labor. Control cases show practically no change in the maternal prothrombin during and after labor.

Patients treated orally with Klotogen during labor show definite rise in the maternal prothrombin level at the end of labor. There was also definite rise in the average level of the cord blood. Patients treated with intravenous synthetic Vitamin K show approximately the same elevation of prothrombin levels.

A small series of patients who were given sodium pentobarbital as an analgesic showed definite depression in the prothrombin level of both mother and child. This depression can probably be prevented by the proper use of Vitamin K.

EDWARD L. CONNELL, M.D.

Turunen, A. The Use of Cesarean Section as an Obstetrical Method of Treatment in The Helsinki Woman's Clinic (Ueber die Verwendung des Kaiserschnittes als geburtshilfliche Behandlungsmethode in der Frauenklinik zu Helsinki). *Acta Soc. med. Fennicae Scandinavica*, 1940, Ser. B 20 Fasc. P. 44.

Turunen finds that cesarean section has increased in his clinic since 1917 from 0.43 to 10.0 per cent. He

classifies the indications for the intervention in four groups: narrow pelvis, nephrotic pregnancy, placenta previa, and other indications. The increase has occurred in all groups, but their percentages have changed. For instance, although the narrow pelvis is still the most important indication, it makes up only 59.6 per cent of the indications against 75 per cent in 1927. While the other indications, especially the miscellaneous group have increased more rapidly. Aphasia of the child due to various causes is an indication which has required consideration since 1927.

The maternal mortality from cesarean section has remained about the same—3.0 per cent. The best results were obtained in the narrow-pelvis group and the most important causes of death were peritonitis and cardiac failure. There is no doubt that the mortality can be reduced by careful selection of cases, avoidance of cesarean section in dry or infected cases, more frequent use of Porro's intervention in infected cases, and the use of local instead of general anesthesia in all variable cases.

The increase in the number of cesarean sections in the four groups seems to have had a good influence on child mortality. There has been a decided decrease in the total mortality of all children (from 6.6 to 4.0 per cent) as well as in that of the delivered children (from .84 to .58 per cent). Therefore it would seem that cesarean section in its present extension and limited according to the previous indications is capable of exerting a favorable influence on the results of delivery in his clinic.

Vaginal cesarean section was employed in 0.14 per cent of the cases, especially in detachment of the placenta, eclampsia, and other severe toxemias, in which the fetus was already dead or not viable. The maternal mortality was high (.5 per cent) for reasons independent of the method of treatment. This intervention is recommended as less dangerous for the mother when the life of the child does not have to be taken into consideration. Sterilization at the time of cesarean section was undertaken in 3 per cent of the cases, with the consent of the patient or of her husband. The percentage of repeated cesarean sections was 9.6 only. Scar rupture occurred in patient who had previously been operated upon elsewhere. RICHARD KURTZ, M.D.

MISCELLANEOUS

Embrey, M. P. External Hysterography: A Graphic Study of the Human Parturient Uterus and the Effect of Various Therapeutic Agents Upon It. *J. Obs. & Gynec. Brit. Emp.*, 1940, 47: 37.

Embrey of the Welsh National School of Medicine presents a hystero-graphic study of the behavior of the human uterus in labor and describes the influence of various therapeutic agents upon the uterus at that time. External hystero-graphy is the method used, the apparatus being a modification of Döderlein's and similar to that often employed by Moir. It consists essentially of a levered cork

GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Foley F. E. B. The Surgical Correction of Horseshoe Kidney. *J. Am. Urol. Ass.*, 1930, 3, 915

The anomaly of horseshoe kidney presents definite clinical problem. It is the problem of what may be called horseshoe kidney disease as distinct from disease of the horseshoe kidney.

A horseshoe kidney not affected by pathological change apart from the anomaly may be productive of symptoms demanding relief. Surgeons have failed, with few exceptions, to accord this relief and apparently have failed to contemplate doing so.

Surgical correction of the anomaly by division of the isthmus and nephrectomy on one or both sides is capable of restoring the normal relationship and relieving the subjective symptoms caused by the anomaly.

Any outspoken pathological change in the horseshoe kidney that is wholly responsible for the symptoms present provides the same clear-cut and definite indication for correction that the same lesion could provide in normally formed kidney.

For the present purpose all cases of horseshoe kidney may be divided into three groups and commented upon as follows:

Group 1. Cases of horseshoe kidney without renal pathological change—symptoms of renal origin. In the majority of cases in this group, logical investigation is prompted by pain. Abdominal symptoms of other than renal origin in large minority of cases the investigation is prompted by the patient on discovery of an abdominal mass, or by the physician on similar discovery.

Since the horseshoe kidney is not affected by pathological change and causes no symptoms, there is no more reason for surgical intervention than there is for intervention in the presence of an undiseased and symptomless kidney of any form.

Group 2. Cases of horseshoe kidney with outspoken renal pathological changes and symptoms of renal origin. Under competent medical care and modern methods of urological diagnosis most cases

in this group are clinically recognized, both the anomaly and associated lesion being clearly demonstrated. In most instances the associated lesion presents the same diagnostic and surgical problems that the same lesion could present in a normally formed kidney. In the combination it may be difficult or impossible to say what part of the syndrome is caused by the lesion and what part by the anomaly. Unless there are good indications to the contrary it may be best to assume that the associated lesion is responsible then correct surgically and let the anomalous relationship undisturbed. Should an unsatisfactory result ensue the anomaly should be investigated, and if good indications are found the anomalous relationship should be corrected by divi-

sion of the isthmus and normal positioning of the separated kidneys.

Group 3. Causes of horseshoe kidney with symptoms of renal origin but without renal pathological change other than some degree of pelvic dilatation. There is reason to believe that a large number of horseshoe kidneys belong to this group and yet, with few exceptions, nothing has been done about them.

If symptoms are present the burden of proof goes with saying that they are not caused by the horseshoe kidney. These symptoms may be referable to the urinary tract or may be vague and indefinite. In the literature particularly in the monograph by G. Herrens, no sound report of cases with pyelogram showing no deformity apart from the anomaly but presenting either symptoms typical of renal origin or vague symptoms possibly of renal origin. If comprehensive investigation fails to disclose an extrarenal lesion capable of causing the symptoms, then there is much reason to believe that the symptoms will be relieved by correction of the anomalous relations, by division of the isthmus, and nephrectomy on one or both sides.

As to the proper clinical management of horseshoe kidney the chief conclusion to be drawn is that the anomaly of horseshoe kidney does not direct any concrete pathological change of significance may be productive of painful and other symptoms, and in conditions development of renal disease and normal anatomical relations can be restored with relief of the symptoms and arrest of the hitherto developing renal disease by appropriate surgical intervention—nephrectomy and nephropexy.

JOHN A. LEE, M.D.

DeTakats, G. and Scupham, G. W. Revascularization of the Ischemic Kidney. *Arch. Surg.* 1930, 4, 394

Four patients with hypertension in whom cases the diagnosis of malignant nephrosclerosis as made were operated on with the idea that the ischemic kidney might obtain some additional circulation. The kidney were decapsulated, the cortex as incised, and the omentum or pedicled muscle flap as mapped around the kidney. The 4 case reports are summarized. One patient has been followed up for three and one half years. In no patient was there definite improvement.

It is possible that if patients with essential hypertension who earlier or more proximal vascular disease were subjected to such procedure the condition might be arrested or improved. The importance of taking renal biopsy specimens and the difficult interpretation of biopsy observations in the early stages are emphasized. For the late stages, in which the patient referred to the surgeon, renal vascularization has been of no value whatever.

JOHN A. LEE, M.D.

Kosic, H. The Action of Posterior Pituitary Extract on Human Ureteral Peristalsis (Die Wirkung der Hypophysenhinterlappenextrakte auf die Ureterperistaltik des Menschen) *Zentralbl f Chir*, 1940, p 1119

The author studied the peristaltic stimulating action of extract from the posterior lobe of the pituitary gland and the peristaltic inhibiting action of "spasmolytica" on ureteral peristalsis of healthy human urinary systems with the aid of cystoscopy and intravenous pyelography and ureterography and reported the following results

The heretofore usual intramuscular and subcutaneous injections of extract from the posterior lobe of the pituitary gland proved to be ineffective in stimulating ureteral peristalsis, in contrast to the intravenous injections, which in smallest dosage produced no unpleasant complications, and were of reliable effect

In the discussion it was indicated that the intravenous method of administration of the drug for the removal of impacted ureteral stones should be abandoned as there is great danger of perforation of the ureter by the impacted stone because of the stimulated ureteral peristalsis. No condemnation of subcutaneous or intramuscular injections was made (NEUPERT) STANLEY ROBBINS, M D

Jewett, H J. Stenosis of the Ureteropelvic Junction, Congenital and Acquired *J Urol*, 1940, 44 247

A study of 71 cases of hydronephrosis has established 3 fundamental causes of obstruction at the upper end of the ureter (1) bands and kinks, 4 cases (5.6 per cent), (2) accessory renal vessels, 24 cases (33.8 per cent), and (3) stenosis, 43 cases (60.5 per cent). In the group of cases in which stenosis was the underlying cause of obstruction, secondary accelerating factors were accessory renal vessels infection, kink and fixation, high ureteral insertion, and, possibly, rapid renal growth during puberty.

In the majority of normal cases there is no line of demarcation between the renal pelvis and the ureter. Any deviation from the normal funnel shaped pyelo ureteral outlet is probably pathological. Deviation of a moderate degree sufficient to cause only minimal obstruction, can be compensated for by work hypertrophy of the pelvic musculature.

When the ureter is normal, a sharply defined and permanently persistent ureteropelvic junction, in the presence of pyelectasis, should be considered obstructive. D E MURRAY, M D

Rusche, C F, and Bacon, S K. Injury to the Ureter Due to Cystoscopic Intra-Ureteral Instrumentation *J Urol*, 1940, 44 777

After a comprehensive study of the medical literature dealing with the problem of injury to the ureter due to intra ureteral instrumentation, we are able to state that the relative infrequency of reported cases is due to the failure to recognize that the ureter has been injured. Slight hematuria or clot protrusion

from a ureteral meatus has been observed not infrequently following the introduction of a ureteral catheter. This amount of trauma may render the ureter inelastic and susceptible to greater damage at subsequent catheterization if carried out before the process has had sufficient time to heal. Indwelling ureteral catheters may cause this same change temporarily. The extreme resistance to perforation of the normal ureter has been studied adequately by Wesson. In his original investigation Wesson states that "a normal ureter cannot be punctured by a catheter" and "it is doubtful if a diseased ureter can be perforated unless a deep ulcer is present." Since the advent of so many instruments designed to assist the passage of or to extract ureteral calculi, the incidence of ureteral injury has increased. Foley recognizes the value of these instruments, when properly employed, in the removal of very small stones. The application of any forceful maneuver at the site of impaction may rotate a rough stone and cause perforation through the adjacent area of disease. Injection of a urographic medium in several instances has completed the perforation through the diseased and traumatized area.

The treatment of a perforated ureter is usually incision and drainage of extravasated urine. In some instances the tissues withstand local infiltration and the inflammatory process heals completely. More frequently, a virulent retroperitoneal extravasation results because of bacterial invasion and calculus occlusion of the distal portion of the ureter. Removal of the impacted calculus should be attempted unless the patient has progressed into an unsatisfactory state. If the calculus is in the distal portion of the pelvic ureter in the female, vaginal incision and drainage of the retroperitoneal space, identification of the ureter, and removal of the calculus are suggested. At the Los Angeles County General Hospital, from January 1, 1928, to March 31, 1939, 19,459 cystoscopic examinations have been made. Among these there have been 10,597 bladder observations and 8,862 ureteral catheterizations (unilateral or bilateral). Our survey of these records discloses, cases of simple trauma being excluded, the incidence of 12 cases of definite injury to the ureter during instrumentation, however, in 1 of the 12 the tip of an instrument was broken off in the ureter and did not perforate its wall. In their private practice the authors have had 3 cases of ureteral perforation following instrumental manipulation.

The authors conclude that intra-ureteral instrumentation causes ureteral injury usually when there is impaction of a calculus and adjacent disease of the ureter. The present increase in incidence of ureteral perforation is related closely to the recent development of many devices designed to remove calculi. The treatment of a perforated ureter usually consists of incision and drainage of the extravasated urine and removal of the calculus. Fourteen cases of ureteral injury and 2 cases of foreign bodies in the ureter due to cystoscopic instrumentation have been reported. JOHN A LOFF, M D

Hiepler A. B.: The End Result of Uretero-Intestinal Implantation. *J. Urol.*, 1920, 44: 704.

The operation of vesical excision by transposition of the ureter to the sigmoid or rectum was performed in 7 patients with a death, a mortality of 7.4 per cent.

When the operation is done for the congenital deformities seen in children, ectropion and epispadias without vesical sphincter the results, both immediate and late, are excellent. There were 6 patients in this group with no postoperative deaths. All of the children are living and all except 2.

When it is done for the acquired lesions of adults, such as carcinoma of the bladder, intractable tuberculous or interstitial cystitis, or inoperable fistulas, the damage to the upper urinary tract secondary to these conditions adds to the operative risk and modifies the functional results. There were 6 patients in this group with a postoperative death, a mortality of 8.3 per cent. There were 4 late deaths, all but 1 of which were from extension of the primary disease and could not be attributed to the uretero-enterostomy. The earlier use of this operation would make it truly conservative procedure and not just desperate means to relieve intolerable bladder symptoms.

One of the chief considerations in successful outcome is the avoidance of obstruction of the ureter at the site of the anastomosis, and to this end the simple methods which avoid too-tight fixation of the ureter in the subcutaneous gutter seem to be the best. Many of the elaborate methods devised to avoid complications seem only to invite them.

In the presence of upper urinary tract lesions the diseased and abnormal ureters add to the technical difficulties and increase the risk of implantation. However, in some cases in which relief is imperative one should not be too easily sidetracked from contemplated uretero-enterostomy by the dogma that abnormal or dilated ureters should never be transplanted. It is surprising to times that good results are obtained under adverse circumstances.

JOHN A. LOEY, M.D.

BLADDER, URETHRA, AND PENIS

Knight F., Uhle C. A. W. and LaTowsky L. W.: The Treatment of Gonorrheal Urethritis in the Male with Sulfathiazole. *J. Urol.*, 1920, 44: 748.

Fifty five cases of gonorrheal rethritis in the male are the basis for this report. Of this number 50 were followed up to the finale of either cure or failure.

The classification of gonorrhea in the male which was used in this study is that of Ekendrath and Rothenick. Of the 55 patients who presented themselves to the authors clinic for treatment there were 34 with cut anterior urethritis, 5 with cut posterior urethritis, 11 with subacute anterior urethritis, 11 with subacute posterior urethritis, and none with chronic rethritis. Of the 45 patients who were eventually cured 11 with sulfathiazole 3 had epididy-

mitis, 2 a perurethral abscess and 1 ginal adenitis before therapy was begun.

The diagnosis of gonorrheal urethritis as based on the history, clinical symptoms and signs and positive bacteriological studies. These bacteriological studies consisted of a smears and culture of the urethral exudate in every case. All stains were done by the Gram technique.

The patients were seen at least a week during the early stages of treatment and later at 10 intervals of one or two weeks. At each visit the customary urological examinations were made and bacteriological work was done at appropriate time intervals. The blood levels of sulfathiazole were ascertained for almost every patient.

In the beginning of the study it was decided to keep the dosage as uniform as possible and to continue treatment until the patient had been free of discharge for one week or until the urine had become clear in both glasses. Since the authors are dealing with ambulatory patients, it was elected to give dosages compatible with the normal activity of the patient. All of the patients received the drug in divided doses usually 3 times a day. Of the 45 patients cured 11 with sulfathiazole the majority received 3 gm. daily for four days, while others received 3 gm. daily for ten to eight days. The total dosage required to effect cure ranged from 1.45 gm. and averaged 25 gm.

The provocative tests were begun when clinical symptoms had ceased and the urine had remained clear for three or four days. These tests were begun early because of the type of patients with which the authors were dealing. Most of the patients had a tendency to delay it when they began to feel that they were improving. The following consecutive tests were required of patient before he could be discharged as cured: (1) alcoholic indulgence (2) passage of sound into the urethra (3) prostatic massage and smears and culture of the prostatic fluid (4) examination of condom specimen and (5) prostatic massage, both smears and culture of the prostatic fluid to be negative for gonococci or more organisms.

The results of treatment are summarized as follows.

Of the 50 patients followed up 48 (96 per cent) were cured as shown by satisfactory excretion. Of the criteria of cure and (4 per cent) were not cured. The result of treatment were uniformly good, no matter what the existing pathological condition as to the time treatment began. The average number of visits to the clinic before cure was completed 6 with range from 3 to 4. Two cases were failures. Both of the individuals in these cases failed to cooperate during the treatment period. There were no complications in any of the cases during the period of treatment.

The effect of sulfathiazole on the erythrocyte count, hemoglobin, leucocyte count, differential count and electrocardiograph studies showed no significant changes. JOHN A. LOEY, M.D.

Kyrie, P. Malignant Melanoblastoma of the Urethra (Zur Kenntnis der malignen Melanoblastome der Harnroehre) *Ztschr f urol Chir u Gynaek*, 1940, 45 287

Malignant new-growths of the urethra are usually carcinoma, the sarcoma is of the greatest rarity, only about 40 instances have been reported. The author has had the opportunity to observe 2 such cases. In a woman of fifty-three years of age a bluish-gray pedunculated polyp, the size of a plum, was located at the orifice of the urethra. It was easily removed and histologically proved to be a melanosarcoma. In the second case a brownish-black pigmented tumor could be traced into the tissues of the wall of the urethra for a depth of $1\frac{1}{2}$ cm.

Two forms of this new growth are to be distinguished,—the mucosal sarcoma and the mural, or parietal sarcoma. The female sex is more frequently attacked. In the male the sarcomas which have been observed have given the impression of being a tumor of the penis and have usually led to the removal of that organ. Apparently these sarcomas develop from pigmented moles, since the location is unusual and no cells of the nature of an anlage for the development of melanotic pigment are found at this point. The 11 cases, reported in the literature which was available to the author, are appended in tabular form.

In the 2 cases operated upon by the author results have so far been good, however, the time is still too brief for prognosis. A group of other patients died within the first eight months from metastases. Subsequent roentgen irradiation was not consistently carried out. Consequently the prognosis is doubtful as late metastasis may develop, even after many years.

(ROEDELIIUS) JOHN W BRENNAN, M D

GENITAL ORGANS

Moore, R A, Miller, M L, and McLellan, A. The Urinary Excretion of Androgens by Patients with Benign Hypertrophy of the Prostate. *J Urol*, 1940, 44 727.

Upon the basis of logic, an endocrine disturbance may be due either to a quantitative change in the rate or amount of secretion of hormones, or to a qualitative alteration in the hormones. Thus in hypogonadism of men, the clinical results of replacement therapy indicate that there is a simple reduction in the amount of effective androgenic substances. On the other hand, in a case of adrenal virilism Butler and Marnan isolated an abnormal androgenic substance.

Morphological studies furnish strong inferential evidence that benign hypertrophy of the prostate is related to the endocrine function of the testis and pituitary. In 1938, the authors undertook to collect data on the hormonal status of patients with benign hypertrophy of the prostate. The studies up to the present time may be divided into 6 phases: the urinary excretion of androgens, the urinary excretion

of estrogens, the chemical nature of the urinary androgens, the respiration (Warburg) of prostatic tissue and the effect of hormones, the chemical composition of prostatic secretion and the effect of hormones, and the anatomical and physiological state of the pituitary gland in patients with benign hypertrophy. In each of the investigations an attempt was made to contrast three groups of individuals, normal young adult men, men over forty years of age with benign hypertrophy of the prostate, and men over forty years of age without clinically demonstrable disease of the prostate. This report is concerned with the first of the above phases, the urinary excretion of androgens by the three types of individuals.

As a control for the observations in older men, 6 three day specimens of urine from 5 normal young adult men between the ages of twenty and thirty-five were collected and assayed.

All results were recorded in the equivalent of international units of androsterone per day. As noted in the discussion of the methods, this represents about one-half the value reported by Koch, but the discrepancy can be accounted for by the difference in the method of hydrolysis.

Urinary androgens in older men without benign hypertrophy of the prostate. Although it is extremely difficult to detect by rectal palpation the earlier stages of benign hypertrophy, a group of 5 men who showed no demonstrable evidence of disease of the prostate were selected for this phase of the study.

Urinary androgens in older men with benign hypertrophy of the prostate. These men in every instance showed clinical evidence of urinary obstruction and had been admitted to the hospital for a prostatectomy. There were 12 three day specimens from 7 patients. In 1 man, 4 successive three-day specimens of urine were collected and accurately assayed and variations in the amount of androgens were found.

In the following table the maximum, minimum, and average results in the three groups of patients are summarized.

TABLE 1—THE EXCRETION OF URINARY ANDROGENS (IN INTERNATIONAL UNITS OF ANDROSTERONE PER DAY)

Type of patient	Average	Maximum	Minimum
Young men	19.4	25.3	10.3
Older men without benign hypertrophy	9.0	16.6	6.1
Older men with benign hypertrophy	6.7	15.3	2.2

The difference in the amount of urinary androgens in young adult men and in the older men with or without benign hypertrophy of the prostate is definite. Only 1 specimen (No. 28) from a young man had a value below the highest value for the older men. Similarly only 2 specimens (Nos. 22 and 1) from older men had a value above the lowest value for young men. We may therefore conclude with a reasonable degree of certainty, that with

increasing age in men there is corresponding decrease in the urinary androgens which are biologically active. Comparison of the values for the 2 groups of older men, one with and the other without benign hypertrophy does not give a sharp difference. Although the average values are 0.0 and 0.7 international units, the degree of overlapping of the figures is considerable. Thus 4 of 5 specimens from men with benign hypertrophy contain less androgens than any of the 5 specimens from men without benign hypertrophy. It may be tentatively concluded, therefore, that the amount of urinary androgens in older men with benign hypertrophy is lower than in men of a similar age without clinically demonstrable disease of the prostate. The values for successive specimens from a patient with benign hypertrophy are insufficient to warrant definite conclusions. They do indicate, however, that there is as much variation in older men as was observed by Koch in young men.

An evaluation of the significance of these results in explanation of the etiology and pathogenesis of benign hypertrophy of the prostate must wait further observations. If the general theory of the blocking effect of androgens on estrogens be accepted, it is possible that the decrease in androgens allows the estrogens to act on the prostate. Most of the specimens reported upon in this paper have also been assayed for estrogens, but the methods used are not sufficiently accurate to warrant discussion here. Newer and more accurate procedures have been developed in the last year and the results will be published later. At that time it will be possible to calculate the androgen-estrogen ratio and to evaluate the decrease of urinary androgens in older men, especially those with benign hypertrophy of the prostate.

The authors conclude that there is a decrease in the amount of urinary androgens in older men as compared to young men. The decrease is apparently greater in men with benign hypertrophy of the prostate than in those free from disease of the prostate. The interpretation of these findings must await further investigation. JONES & LOEW, M.D.

Neubert, R. M. The Treatment of Prostatic Obstruction. *New England J. Med.* 1919, 3: 43.

The author attempts to clarify the much discussed treatment of prostatic obstruction. He concludes that the selection of operation for benign prostatic hypertrophy must depend on the experience and technical skill of the individual surgeon, it probably being true that in equally skillful hands the suprapubic operation carries higher mortality than do the other methods, and that the perineal and transurethral operations have comparable mortality.

All three operations when skillfully performed can be expected to produce excellent result although the author favors the transurethral operation above the suprapubic prostatectomy. Urinary incontinence and rectal injury which are occasional complications of perineal prostatectomy even

in the most skillful hands, are not to be expected in either the suprapubic or the transurethral operation.

From the standpoint of the patient, properly performed transurethral resection shows to advantage over the open methods of prostatectomy in those factors of comparison which interest him, that is, he has a more comfortable and more ambulatory postoperative period, his period of hospitalization is shorter and his functional results are at least good.

It is the author's opinion that the advantages of transurethral prostatectomy make it the operation of choice for benign hypertrophy whenever it can be properly performed. He believes that the size of a benign gland does not constitute a criterion for or against resection except in relation to the skill and dexterity of the individual surgeon. The accomplished resectionist must recognize his own limitations and select the operation with a full and honest recognition of those limitations. Transurethral resection has a place in the armamentarium of every urologist; the degree of its usefulness, like that of the other methods of prostatectomy, depends on the skill and judgment with which it is employed.

D. E. M. vs. M.D.

Scott, R. T. Torsion of the Appendix Testis. *J. Clin.* 1910, 44: 755.

The appendix testis or hydatid of Morgagni is vestigial structure representing the cranial end of the müllerian duct. It has been called the non-pedunculated hydatid of Morgagni in contradistinction to the pedunculated hydatid of Morgagni, or appendix epididymalis. However it is probably pedunculated as often it is non-pedunculated, which accounts for its liability to torsion. That torsion of this appendix testis may produce a very painful and disabling lesion has only been appreciated in comparatively recent years.

Several small embryonic remnants, the seat of pathological lesions, are located within the scrotum in close relationship to the testis and epididymis. Of these the appendix testis is most liable to pathological changes. It lies between the upper pole of the testis and the epididymis; it is about 3 cm. in diameter and is usually pedunculated. Occasionally, however, this peduncle may attain considerable size. Histologically the appendix testis consists of vascular connective tissue in which are irregular canals lined by columnar epithelium.

The exact cause of torsion of the appendix testis is no more clearly understood than torsion in other organs possessing a pedicle. Apparently infection plays no rôle. Since torsion may occur during sleep, violent muscular contractions do not appear to be a factor. The outstanding symptom is pain. This is usually severe and unaccompanied by any degree of shock. The pain may be relieved spontaneously only to come on again in other attacks. There is little or no elevation of temperature and urinary disturbance is usually absent. There may be moderate degree of leukorrhea present which prevents accurate

palpation of the scrotal contents McFadden states that the most significant symptom is edema and redness of the scrotum This is always present and is out of all proportion to the minuteness of the lesion If the patient is seen several days after onset, the edema will have subsided and a small pea-sized mass may be palpated at the upper pole of the testicle Palpation of this mass is usually not possible during the acute stage There is no alteration of the relationship between the cord and testicle Expectancy should play no part in the treatment of this condition, since operation is simple and without risk, and recovery without surgery requires more time than with it In addition, detorsion may occur and the individual may thus experience repeated attacks of torsion Undoubtedly many of these cases are not recognized and drag out a long and painful course before recovery ensues Randall advises that both sides be operated upon at the same time as the pedicle of the opposite side will usually be found to be elongated If expectant treatment is employed recovery will require from two to three weeks Recovery following operative treatment should not require more than from five to seven days

Ewell, G H, Marquardt, C R, and Sargent, J C
End-Results of the Injection Treatment of Hydrocele *J Urol*, 1940, 44 741

The principal objection to treatment of hydrocele by injection has been the possibility of overlooking co existing pathological conditions such as cancer or tuberculosis, or the injection of the quinine solution into the peritoneal cavity in cases of congenital hydrocele The authors still believe that with care exercised in the taking of the history and in physical examination, these possibilities can be reduced to a minimum When the possibility of such co existing pathological processes exists, operation always should be advised The danger of the introduction of infection can be obviated by proper care in the technique The authors have never recommended the method as a minor procedure, although the treatments may be given in the office, dispensary, or in the operating room of the hospital on an ambulatory patient

Most authors in discussing the surgical treatment of hydrocele are prone to minimize the questions of recurrence and infection Young, in his recent article points out clearly the danger from hemorrhage following the Winkelman operation and proposes his operation to obviate this danger He mentions also the disadvantages of Andrews bottle operation That recurrences do occur following surgery will be shown by the statistics

Some writers refer to such annoying sequelae as painful contracture lobulated collections of fluid and adhesions which follow the injection of a strong irritant solution into the tunicular sac The authors point out again that the quinine solution which they used differs radically from the solutions previously used, such as iodine and phenol, and while any

chemical solution not isotonic in nature is irritating when injected into any body cavity, they question the term "strong irritant" when applied to the quinine urethane solution

In the follow-up examinations of these cases, they did not observe a single case of painful testicle or painful retraction of the testicle Neither were there lobulated collections of fluid There were no cases of atrophy of the testicle Small epididymal cysts were commonly found and they occurred about as often on the opposite untreated side In most cases, some slight tunicular thickening was demonstrated If the quinine solution was inadvertently injected into the tissues outside the tunicular sac, pain and swelling followed This happened in the authors' cases but sloughing never occurred, and the swelling and induration gradually subsided

In this series of cases of hydrocele and spermatocele, some of the patients are still under treatment or have been followed for a few months to seven years Their ages ranged from three months to eighty six years The amount of fluid varied from a few to 1,650 c cm The patient with 1,650 c cm of fluid required 6 treatments and has remained cured for more than two years The duration of the hydroceles varied from a few months to seventeen years The average number of treatments has been 3 Quinine and urethane have been used in all except 6 cases in which sodium morrhuate was used, its use has been discontinued

The authors conclude that the injection treatment of hydrocele and spermatocele with quinine hydrochloride and urethane solution is a safe and effective procedure and in the vast majority of cases consider it to be the method of choice

JOHN A LOEF, M D

Gilbert, J B Studies in Malignant Testis Tumors Syndrome of Choriogenic Gynecomastia *J Urol*, 1940, 44 345

One hundred and twenty-nine cases of gynecomastia associated with malignant testicular tumors are analyzed Six personal cases are added, which make a total of 135 cases This total is subdivided into 2 groups

Group 1 includes the 103 cases of gynecomastia associated with teratoid tumors These 103 cases include 54 primary testicular tumors, 7 so-called extragenital chorio epitheliomas (in 4 of which the testes were incompletely examined), 11 apparently misdiagnosed chorio epitheliomas, and 31 teratoid tumors with a clinical course strongly suggesting the presence of chorio-epithelomatous elements

Group 2 comprises 2 personal cases and 18 cases from the literature which were eliminated from discussion in the group of true choriogenic tumors with gynecomastia The breast stimulation was non-functional, and not related to the testis tumor

The characteristics of the syndrome of choriogenic gynecomastia with testis tumors consist of

- 1 Chorio epithelioma in the primary or meta-static tumor

Gynecomastia, usually bilateral, with glandular-thymic hyperplasia which is often the only clinical symptom present.

3. Enlargement and hyperpigmentation of the areolas usually occurring together.

4. Physiological activity manifested by either gross or microscopic secretion in the breasts.

5. High titers of chorionadotropic (huteinin g Prolan B) hormones and the presence of folliculin (estroone).

6. Histological changes in the pituitary gland described generally as "pregnancy cells."

7. Hyperplasia of the prostate and of the seminal vesicles—generally of both—is frequently found.

D. E. MERRILL, M.D.

MISCELLANEOUS

Allyn, E. P., and Roberts, L. C. Chemotherapy in Non-Specific Infections of the Urinary Tract. *J Am Med Ass* 940, 5 345.

Revolutionary changes in the treatment of infections in the urinary tract have been made, and an attempt is made by the authors to review the newer drugs in the urological armamentarium and to specify as nearly as possible specific drugs for specific treatment of bacterial infections in the urinary tract. They question the prophylactic use of pre-operative medication, and conclude from their personal experience that:

1. The sulfonamide drugs are excreted by the kidneys in a manner exactly similar to phenolsulfonphthalein.

In vitro and *in vivo* studies show the specificity that the sulfonamide drugs have for different bacteria and different strains of the same bacterium.

3. Experimental studies *in vivo* are not necessarily entirely comparable *in vitro*.

4. The action of sulfonamide drugs in infections of the urinary tract depends more on the tissue reaction than on direct bactericidal action in the urine.

5. Mandelic acid is an excellent drug for infections with the colon bacillus and streptococcus fecalis.

6. Colon bacillus infections treated with sulfanilamide and with sulfapyridine show practically the same proportion of cures, 8 per cent.

7. In staphylococcal infections sulfapyridine produces cure in 75 per cent of the cases and sulfanilamide in 62.5 per cent.

8. The response to sulfonamide drugs is rapid, usually within two or three days.

9. Infections complicated by other pathological changes do not respond as favorably as the simple infections.

10. A comparison of sulfanilamide and mandelic acid therapy in various types of cases shows that sulfanilamide is usually preferable.

11. The high drug concentration in the urine usually thought desirable, is not necessary for cures.

A dosage of 2.8 gm. of sulfanilamide a day with fluids *ad libitum*, produced as good results as did 3 gm. a day with restricted fluids. The same is true of sulfapyridine.

12. Many patients cannot take the large doses with restricted fluids, but the recommended small dosage is tolerated by all. D. E. MERRILL, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC

Seddon, H J, and Strange, F G St C. *Sacro-Iliac Tuberculosis* *Brit J Surg*, 1940 28 193

Sacro iliac tuberculosis is essentially a disease of young adults, 80 per cent of cases occurring between the ages of sixteen and thirty five. This distinguishes it from all other forms of joint tuberculosis.

There is little difference in sex incidence. Of 176 patients, 85 were males and 91 females.

There are three distinct clinical types: (a) an isolated lesion without sinuses—33 per cent of cases; (b) an isolated lesion with sinuses—31 per cent of cases; and (c) a lesion, with or without sinuses, but found associated with tuberculous lesions elsewhere—36 per cent of cases.

Abscess formation is exceedingly frequent, occurring in 72 per cent of the cases, and usually the pain subsides when the abscess develops. In 44 cases pain was a prominent symptom and at no time did an abscess develop. In 40 cases pain was present at first, but ceased when an abscess developed. In 43 cases pain and abscess were coincidental.

Sinus formation is also frequent, occurring in 42 per cent of cases. In 53 cases sinuses complicated an apparently isolated joint lesion. In 21 additional cases, with more than one manifest lesion, sinuses were also present over the sacro iliac joint.

Tuberculous lesions found in association with sacro iliac disease are frequent, they were present in more than one third of the cases, and were sometimes multiple. The author emphasized the fact that the associated lesions were all clinically obvious and it is possible that a higher incidence would have been revealed by the routine investigation of the lungs and the kidneys.

The most common sites for associated lesions are the lungs and joints, particularly the lumbar spine. Lesion of the joint surfaces is the most common roentgenographic finding; para articular cavitation of bone is not infrequent.

Prognosis as to life depends chiefly on the clinical type of the disease. The mortality rate over a six year period is as follows: closed isolated lesions, 10 per cent; isolated lesions with sinuses, 25 per cent; lesions associated with tuberculous foci elsewhere, 55 per cent. After six years the mortality rate is almost negligible.

Recovery generally means that the patient will be able to return to work with full capacity, and relapse is rare. A certain amount of chronic invalidism is due to sinuses.

Pregnancy does not cause relapse, provided that the disease has healed soundly. Bony ankylosis is probably the usual end result of conservative treatment, even in the absence of secondary infection.

The principles of conservative treatment are well known and should be followed in every case. In order to obtain good results the time element must not be considered.

Operative fusion of the joint may be beneficial, but its merits have not yet been clearly demonstrated. The best field for operation is not in curing the disease, but, as a final procedure, in converting unsound fibrous ankylosis into stable bony fusion. The average period of hospitalization is eighteen months, and is not materially altered by operation.

Gill, A B. *Legg-Perthes Disease of the Hip, Its Early Roentgenographic Manifestations and Its Cyclical Course* *J Bone & Joint Surg*, 1940, 22 1013

The author employs the name Legg-Perthes disease of the hip inasmuch as no adequate pathological term has been suggested, and since the name "Legg-Waldenström Calvé Perthes disease" is too cumbersome.

The onset of symptoms has been observed in children between the ages of three and eleven years, and 85 per cent have been boys (a contrast to the sex incidence of congenital dislocation). Tuberculin reactions have been consistently negative and the blood sedimentation rate has been normal. In a few cases a definite history of injury, immediately preceding the onset of symptoms, was obtained, but more frequently such a history was lacking. A few cases showed definite evidence of endocrine imbalance, but this cannot be accepted as an etiological factor unless it is proved in all cases.

The author's present conception of Legg Perthes disease is that it follows a primary aseptic necrosis in the metaphysis that is due to an interference or blocking of the blood supply. The cause of this obstruction is yet unknown. The degenerative changes that occur in the head are also in the nature of aseptic necrosis which follows alterations in the blood supply through the metaphysis and epiphyseal plate. The deformities that arise in the head and neck are due to a mechanical crushing of the necrotic tissue which is caused by weight bearing and muscle pull. Deformity of the acetabulum is dependent upon the altered shape and position of the head.

The disease is often far advanced at the onset of symptoms. These initially are limp and pain, which is most commonly felt in the knee. Symptoms may not be continuous and they may frequently disappear after rest in bed for a few days. On first examination there are limitation of motion, particularly that of rotation of the femur, and definite, firm thickening of the hip. Occasionally there is slight wasting of the muscles of the thigh.

The striking and uniform feature is an early necrosis in the metaphysis of the neck of the femur.

that may be made to stand out more clearly by slight overexposure of the roentgenograms. The areas of decalcification vary in number, size, shape and location. Most common they first appear at the outer margin of the neck or in the center less frequently at the inner margin. Occasionally they may be large and conical, resembling an infarction, with the base against the epiphyseal plate. As time passes they multiply, enlarge, coalesce and finally form a broad band of decalcification across the entire metaphysis. Waldenström's sign is almost always positive.

The concomitant or subsequent degenerative changes that occur in the head of the femur directly overlie the first area of necrosis in the metaphysis and as the disease spreads in the metaphysis, it extends correspondingly in the head. This suggests that the degeneration of the head is the result of the necrosis in the neck. Irregular areas of decalcification enlarge and leave isolated areas of increased density which produce an appearance of fragmentation. This may progress until the remains of the head are barely visible.

This phase of degeneration and disintegration extends through a period of about year and half. It is prolonged by lack of treatment and shortened by adequate care.

The change in cycle between degeneration and regeneration can be noted in successive roentgenograms taken at two-month intervals. Regeneration is usually apparent in the metaphysis before it is apparent in the head. The decalcified areas in the neck disappear as new bone forms. Then recalcification appears in the head. The metaphysis will be restored to its normal appearance long time before regeneration of the head is complete.

The fact that regeneration first occurs in the metaphysis and is completed there first, again points to the conclusion that the changes that occur in the head are dependent upon the primary changes in the metaphysis. The time required for complete regeneration of the head is approximately from three to three years.

The diagnosis is easily made when the pathological process is fairly advanced, but it is attended with some difficulty in the very early stage. Careful comparison of the suspected and involved hip with moderate overexposure of the roentgenogram will reveal the appearance of necrosis in the metaphysis. This is so constant that the thor is unerring in making roentgen diagnosis of Legg-Perthes disease without its presence.

The thor also stresses the value of careful palpation with the hip grasped between thumb and fingers so as to detect the slight difference in thickness between the two hips. A slight but firm thickening can almost always be felt. Legg-Perthes disease thus contrasts with the more marked, soft thickening perceptible early in bursitis of the hip.

Whenever possible, the child is put to bed with the child's extension on both legs and is kept in bed

until regeneration is well advanced. The child is then allowed to go about with a walking brace with a perineal crutch, high shoe on the well leg, and crutches. When these requirements can be carried out without interruption the end-results are practically perfect hips. Full weight bearing is not permitted until regeneration is well advanced.

Photographs of more than 70 roentgenograms illustrate the discussion of cases and furnish visual evidence of the diagnostic points that the thor stresses.

HOWARD FREEMANT, M.D.

Coxen, L., and Greene, W. Congenital Equinovarus. *Bull J Surg Obst Gynec* 1926, 45: 697.

The authors studied 66 cases of club foot. Sixty-one of these were bilateral, while the unilateral cases were equally distributed, there being 8 on the right and 7 on the left side. The authors separated the cases for study into groups based on factors such as age, date of institution of treatment, severity of the deformity and the degree of parental cooperation. These cases were treated by many methods used by all members of the Orthopedic Staff of the Children's Hospital in Boston, between the years 1924 and 1930. Nine tables together with appropriate illustrations depict the graded results in each group.

The thorax is not didactic in their statements, as they do not state that the many variables reduce their findings to opinions rather than facts. They are proper severe with themselves in their definition of recurrence (a thing that is an return of the equinus in eversion or adduction after its having been bent on prior date). The following conclusions represent the essence of their findings.

Almost as a form of accepted treatment (1) bring about an improvement but those (2) produce permanent satisfactory results. (3) without careful and frequent check up and diligent cooperation of the parents carrying out the home program of treatment.

Excessive trophy of the calf can be prevented by preventing recurrence of the deformity and thus voiding the necessary long period of rigid plaster immobilization.

3. Shoes for club foot are overrated factor in successful treatment. J. M. K. S. Cox, M.D.

Scherb, R., Francillon, M. R., and Durchhardt, E. Foot Disorders in Military Service (Umschreibung des im Militärdienst) Scherb and Durchhardt 1931, 70.

There is current fallacious theory that those foot deformities and disturbances belonging to the large group of cases of incomplete flat foot and hallux valgus, the condition can be cured by placing support on the shoe. The pathogenesis of foot disorders is of extremely complex nature and cannot be explained on pure morphological basis. A classification of foot disorders is at present impossible. It has been shown that the study of foot deformities must include study of musculocutaneous relationships in

and their disorders. Every foot deformity constitutes an individual problem which requires an individual solution. A routine prescription for arches or supports is impossible. Since mobilization, all these complex problems have become acute and demand extensive revision. These findings are based on experiences in the Department of Military Sanitation VI, and in the army. The disturbances vary greatly in degree and do not always correspond to the degree of deformity. A person with severe flat-foot may be quite capable of military service, whereas some slight deformity may completely incapacitate another person for this strain. The authors present a brief review of the lesions under consideration.

If there is complaint of foot pain, and an objective and subjective sensibility to pressure can be demonstrated on the mesial side of the scaphoid, an os tibiale externum may be suspected. The roentgenogram will be the determining factor. In this condition, as in the rare os trochleare on the external side of the calcaneus, arch supports will be of no benefit and only extirpation will afford relief. Circumscribed painful areas of the short muscles of the foot may often suggest foot deformity, but are, as a rule, only a result of overexertion. Such painful areas are not unusual even in a normally shaped foot. Pain is felt in the abductor hallucis, the interossei, the quadratus plantae, and the abductor digiti quinti muscles. Now and again these areas may be confused with calcaneus spurs. In the differential diagnosis one must also consider beginning chronic inflammatory processes of the ligamental apparatus of the foot and chronic monarthritides. Also a beginning arthritis deformans must be considered.

The authors then proceed to give a brief review of the various deformities of the foot. In primary, osteogenic, incomplete flat-foot, the neck of the talus is far forward, so that the medial series of tarsal bones and the first metatarsal are not curved in an arch but lie flat, parallel with the substrate. Besides this flattening of the talus, there is also a wedge shape with its base medial, and a wedge shape with a plantar base. A short resumé of myogenic weak arches and flat foot and of contracted cases follows. The variety of foot disorders taught in the post graduate courses was small, but active service has brought about considerable changes. For prophylactic purposes it has been decreed that digging assignments should be interrupted regularly by marching assignments. Diagnostically, the army doctor has little difficulty. For this reason it is ordered that orthopedic patients in various army units are to be examined and balanced once weekly by specialists. At this station a certain classification is effected of cases that can be treated here and cases that will have to be sent to the Department of Military Sanitation. The revision of orthopedic council into larger societies is still too new to permit a report of experiences.

The authors are of the opinion that soldiers requiring arch supports should be sent to a Depart-

ment of Military Sanitation where special doctors and suitable apparatus for proper treatment are available. As regards prescription for supports, the following points should be observed:

- 1 The arch is intended to support the foot, which entails the necessity of having it placed in the shoe in such a manner that it cannot slip.

- 2 As broken arches usually require a supportive propping up of the os calcis, the supporting arch should begin not under the Chopart's joint but under the corpus calcanei. At the level of the scaphoid the arch of the inlay should bulge somewhat.

- 3 If the plantar cushions of the metatarsal heads II and III are painful, these pains may also be treated by inlays, but the support must be placed directly beneath the heads, and the inlay must not be too short.

- 4 The shoe must not slide over the inlay. In military patients simple supports with steel spring inlays may often be used. The inlay must fit the shoe. A discussion of footgear would take us too far afield.

If it is desired to help a flat footed person to walk comfortably with arches, protective training is indicated. Muscular weakness may be treated by massage and counter irritation of the periosteum with antiphlogistic compresses and ointments. The inlays should not be planned for immediate maximum correction, but should be gradually brought to this point. Inlay treatment is a distinctly individual procedure. Surgical interventions are rarely indicated (skeletal changes in the shape of the talus and scaphoid, which are treated with wedge resections). In hallux valgus, the two-thirds resection of the basal phalanx of the great toe, according to Brandes, is best.

(SCHWEIZER) EDITH SCHANCHE MOORE

FRACTURES AND DISLOCATIONS

Guleke, N. Gunshot Fractures of the Long Bones in the Vicinity of the Joints (Ueber die gelenknahen Schussbrüche der Roehrenknochen). *Deutsche Mil. arz.*, 1940, 5: 257.

In his time Franz demonstrated by gunshot experiments that the splintering of the diaphyses of the long bones following injury by infantry missiles did not, as a rule, extend beyond certain limits, regarding, of course, more extensive fissures. These limits were given as from 11 to 13 cm. for the thigh, from 8 to 9 cm. for the upper arm, from 10 to 11 cm. for the lower leg, and from 4 to 6 cm. for the forearm. Guleke draws attention to the fact that the conditions are different for the metaphyses. In metaphyses of similar shape, as in the lower end of the upper arm, radius, thigh bone, and upper and lower ends of the tibia, one finds besides the actual zone of comminution, extensive fissures reaching up to or even into the joint. One frequently encounters Y or T fractures either because of fine fissures or cracks with or without displacement of the condyle. The clinical diagnosis as to whether or not the joint

is involved is often impossible. This decision can be made only after stereoscopic roentgenographic examination or from roentgenograms in at least two planes. If the presence of infection there is the risk of the infection involving the fracture this usually follows but not necessarily.

Gulek the emphasis lies the difficulty of diagnosis, for this secondary infection does not, a rule manifest itself in cut inflammation willing emphasis, but usually develops insidiously as capsula phlegmon. This fact well as the fact that one can frequently aspirate no pus on puncture in these cases, is little known. Even experienced surgeons may be misled thereby. The patients gradually fall victims to an insidious sepsis, the symptoms of which are readily overlooked by the physician. Daily attendance because he attributes them to the badly infected fracture. Diagnosis is imperative however. For this purpose an early exploratory arthrotomy through small incision is recommended, on the basis of the author's own experience. One may then frequently be astonished to find a dirty purulent joint cavity without much exudate, with fistula tracts into the surrounding tissues and the greatly feared fistular abscesses. In such cases the popular small button-hole incisions afford drainage and permit irrigation nothing more. It is necessary to make large incisions through the entire capsule. However if this does not bring rapid results, one has no alternative but typical or atypical resection. Thereafter the joint cleft must be kept wide open by longitudinal traction.

The illusion that fresh infection of the bone may be caused by sawing the bone under such septic conditions has been refuted by experience. Nor has Gulek ever observed progressive suppuration in such sawed bone surfaces. One is constantly surprised at the rapidity with which the latter are covered with good granulations and also if the resection has been properly timed, the speedy recovery of the patient.

As regards the indication for resection or amputation, it is not the severity of the intervention that is to be the determining factor but the consideration as to whether the patient is in condition either the longer morbidity associated with resection. With hemostasis and blood transfusion, resection *per se* is not such a serious intervention but it must be done early. In the presence of chronic even though apparently mild course of the general infection, resection done later on weeks is usually too late. Amputation is indicated only when the general condition of the patient is such that resection with subsequent morbidity could seem justifiable or when no marked improvement has followed resection within ten to fourteen days. The fact that so many surgeons shun resection is attributable according to Gulek to the fact that it has been little used in present day peace-time surgery. The war surgeon has need of it however and should be trained for it by regular courses in operating upon the cadaver. Such training is also indispensable for the treatment

of the frequent gunshot injuries of the blood vessel and should be included in the peace time curriculum of the student and in postgraduate courses.

(TRANS) EDITH SCH. VORL MOORE.

Key J. A.: The Treatment of Complete Fractures of Both Bones of the Forearm. *Surg. Clin. North Am.* 1930, 30, 395.

A series of 8 patients each of whom suffering from fractures of both bones of the forearm in which the fragments are displaced, as presented with brief case histories. Each of the patients treated by one individual and each patient presented a slightly different problem.

The most satisfactory results were obtained in the first and second cases presented. The first as seen immediately after the accident and in this one a satisfactory but not anatomical result was accomplished by manipulation; the second seen three days after the accident and in this it was possible to obtain satisfactory but not anatomical reduction after much difficulty. The next most satisfactory results were obtained in Cases 6 and 7 in which open reduction was performed.

The least satisfactory results were obtained in cases in which wire traction with a mechanical reduction apparatus had been used. The result in Case 5 was also unsatisfactory in that the author was content with a false reduction by conservative means. He believes that better result could have been obtained in this case by prompt open reduction with adequate internal and external fixation.

In the last case in which there was severe damage to the soft parts, he had a satisfactory result, when one considers the type of injury which was present.

Key believes that if satisfactory and stable reduction cannot be obtained by a competent surgeon at the first attempt in fractures of both bones of the forearm, open reduction and internal and external fixation should be resorted to if competent surgeon and adequate facilities are at hand. For internal fixation he prefers small stainless steel wire loops. The sprinkling of small amount of sterile sulfanilamide powder in the wound before it is closed has greatly decreased his fear of infection after open reduction. External fixation is in his experience best obtained by means of long posterior and short anterior padded rods applied which are encased in plaster of Paris cast. The cast extends from the middle of the arm to the bases of the fingers and is so cut out in the palm that free exercise of the thumb and fingers is possible.

E. H. C. ROBINETTE, M.D.

Zollinger, F.: Statistical Studies of Leg Fractures During 1933 and 1934 (Statistische Untersuchungen ueber die Urtrennungskriterien der Jahre 1933 und 1934. *Ztschr. f. Unfallmed. Berufshyg.* 1935, 33, 59.)

Of 336 cases of leg fracture, 833 are reviewed for type of treatment and comparisons were made with various earlier statistics. The exact statistical

material must be read in detail in the original articles as only the most significant results are presented here

The average treatment required ninety-three and seven-tenths days, the average period of disability was eighty-seven days. Amputations, pseudarthroses, and combination injuries were not included. However, the survey includes not only shaft fractures, but also malleolar fractures, as well as fractures of one or both bones. Among the industrial fractures 73.7 per cent healed without, and 26.3 per cent with residual invalidism, requiring insurance or permanent disability payments.

The author followed this general survey with results of the special types of fractures.

I In 1,106 isolated fractures of the external malleolus the average duration of disability was from forty-four to sixty-two days. Walking casts required a definitely shorter period than circular casts. An invalidism of 8 per cent was noted.

II In 188 isolated fractures of the inner malleolus the disability lasted from forty-six to seventy-five days. The same results were obtained from treatment as in Group I. Invalidism resulted in 22 per cent.

III In 258 fractures of both malleoli the disability lasted from sixty-six to one hundred and fifty-nine days. Traction required the longest time for treatment, walking casts required the least time. Invalidism resulted in 43 per cent.

IV In 390 fractures of the fibula the disability lasted from twenty-nine to sixty days. Invalidism resulted in 6 per cent.

V In 254 fractures of the tibia the disability varied from forty-four to two hundred and thirty-three days. The majority were treated with circular plaster casts, very few with walking casts, so that a comparison is not possible. There were 3 deaths and 1 case of pseudarthrosis, invalidism resulted in 23 per cent.

VI In 555 shaft fractures of both bones the disability lasted from one hundred and three to one hundred and ninety-five days in the cases which were not operated upon, and two hundred and thirty-four days in the 35 that were. Invalidism resulted in 57 per cent. Traction and circular casts were employed about equally. Unna paste boots and walking casts were seldom used. Operative treatment required the longest time (234.29 days), then traction (195.13 days), and then circular casts (143.46 days). The observation of Ostermann that traction required a longer time is confirmed here. Comparisons were made with the statistics of several other authorities. There were 6 deaths, 16 amputations and 26 pseudarthroses.

VII In 26 cases of fracture of the head of the fibula the disability lasted from forty-three to forty-nine days, invalidism resulted in 14 per cent.

VIII There were 67 fractures of the head of the tibia with 1 amputation. Disability lasted from sixty-three to one hundred and ninety-three days, invalidism resulted in 56 per cent.

IX There were 10 fractures of head of tibia and fibula. The disability lasted from one hundred and thirty-nine to two hundred and fifty-three days. All patients were invalided.

X There were 119 fractures of the inner malleolus with fracture of the shaft of the fibula. Disability lasted from sixty-three to one hundred and sixty-seven days. Traction required the longest time, walking casts took the least time. Invalidism resulted in 39 per cent.

XI Operative treatment was given in 61 cases, or 2.2 per cent. In this group alone were encountered 35 cases of shaft fracture of both bones. For the most part Lane plates were used.

Traction was utilized in only 10 per cent of all the malleolar fractures, and was usually obtained by use of a Kirschner wire. The author stated that such treatment required a longer time and was used for greater disabilities than the plaster or metal splints.

A special study of compound fractures established no greater morbidity. It was merely stated that there were 173 cases (6.2 per cent).

(FRANZ) JEROME G. FINDLER, M.D.

Bode, F. Failures Following Open Reduction of Fresh Fractures and Their Lessons (Die Fehlheilungen blutig eingenchelter frischer Frakturen und ihre Lehren) *Arch f orthop Chir*, 1940, 40: 285

The indications and avoidable errors of open reduction treatment are discussed on the basis of a perusal of the performances of 70 colleagues. The old conservative method is the usual procedure. On the other hand, operative procedures are preferable at present in any group of fractures. Indications must be strictly followed.

Operation should be undertaken at the opportune time since delayed intervention makes the prognosis less favorable. Efficient control of pain is essential for closed reduction, inasmuch as reflex muscle resistance under certain conditions makes correction impossible and thereby leads to unjustified operations on fractures. Interposition of the soft parts only rarely makes open operation imperative, but it is necessary in compound penetrating fractures after successful débridement. In ankle fractures the diastasis of the ankle must occasionally be corrected by suture. The necessity of suturing patellar and elbow fractures with wide diastasis is generally recognized. Open operations must be considered in fractures of both bones of the extremities. Rarely is it necessary in intra-articular fractures of the head and through the surgical neck of the humerus. In cases of nerve injury in which it is necessary to expose the nerve, the fractured fragments may be engaged or mechanically fixed at the time of operation. Laminectomy is indicated only when bone splinters exert pressure on the spinal cord. If the spinal cord merely "rides" on a fragment of a vertebral body, laminectomy is unnecessary. Here non-operative treatment is preferable.

Compound fractures are managed according to the fundamentals of wound treatment. The use of foreign material for bone suture is to be avoided. Wound infections following open operation are unfortunately still frequent. It must be recognized that the condition of fresh or recent fracture wounds, with regard to implantation and further growth of bacteria offers a better possibility of the development of accidental wound infection than the tissues in their normal condition. The most favorable time for operation lies between the eighth and tenth days after the injury. Bony union is the measuring rod for the effectiveness of the asepsis of the operative method. 12A-steel is employed as basic suture material. A number of practical hints on technique are offered.

The experiences gathered from these performances are summarized and the significance pointed out.

For the majority of fractures conservative treatment is the usual procedure. Only when reduction cannot be achieved in this manner is operative

treatment indicated. Strictest indications should be observed and recorded in the chart for the medical history. Slight lateral displacement of the fractured fragments offers no indication for open reduction if the normal eight-bearing line of the fractured fragment is retained within reasonable limits. Soft part interposition, apart from the interposition of nerves rarely offers indication for open reduction. The closest attention should be given to asepsis, technique and gentle handling of the tissues. Foreign material should be used sparingly. Wire often fails to hold firmly and therefore brings about conditions unfavorable for bony union. Bone suture makes an immobilizing plaster bandage imperative.

In conclusion it may be said that the results of operative treatment of fractures are by no means satisfactory at the present time. The number of failures is considerable. The failures cannot be charged to the method used but primarily depend on the manner in which they are carried out.

(Trans.) JOHN L. LINGGUTH, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Gage, M., and Ochsner, A. The Prevention of Ischemic Gangrene Following Surgical Operations upon the Major Peripheral Arteries by Chemical Section of the Cervicodorsal and Lumbar Sympathetics *Ann Surg*, 1940, 112 938

A normal peripheral circulation (arterial, venous, and lymphatic) is dependent on several factors, among which a residual arteriovenous pressure, capillary pulsations, and sympathetic balance are important. The sudden occlusion of a major peripheral artery disrupts the normal physiological processes concerned with maintaining a normal circulation distal to the point of obstruction. Consequently such a vascular accident frequently but not always results in ischemic gangrene.

The prevention of the development of ischemic gangrene following the sudden occlusion of a major peripheral artery is dependent upon the establishment of an adequate collateral circulation. The functional capacity of the collateral circulation varies according to the site of the obliteration, obliteration of the common femoral carotid artery at its bifurcation and of the popliteal arteries being frequently followed by grave consequences. As the collateral vessels are under control of the same sympathetic system which controls the main artery, any disturbance, direct or reflex, within the main arterial stem affects the collaterals secondarily.

A review of the literature shows that the incidence of ischemic gangrene following the sudden occlusion of a major artery varies between 5.2 and 45.8 per cent and that these figures are dependent not only on the mechanism (trauma 11 to 48.5 per cent, ligations for aneurysms 5.2 to 15 per cent, and embolism averaging over 30 per cent) but also on the location of the obstruction. Various investigators found the incidence of gangrene in the extremities following injury to the main arterial trunks to range between 11 per cent (Kretzschmann) and 40.2 per cent (Tuffier). Statistics illustrate that the incidence of gangrene is higher when the lower extremity is involved than when the upper extremity is involved. It is likewise brought out that the closer the obstruction is to the aorta the higher the incidence of gangrene. An exception occurred in the popliteal artery, the sudden occlusion of which resulted in a high incidence of gangrene. Reported series of sudden occlusion by emboli showed the incidence of gangrene to vary between 30 and 70 per cent. In another author's series of 44 emboli occurring in 36 patients of whom only 12 were operated upon, the incidence of ischemic gangrene was 67 per cent. Sudden occlusion of a major peripheral artery resulting from an operation for the cure of an aneurysm carried with it an incidence of ischemic

gangrene of 5.2 per cent (Matas) and of 15 per cent (Bird).

The sudden occlusion of a major peripheral artery produces the following pathologicophysiological changes: (1) sudden obliteration of the peripheral pulse, (2) marked decrease in the blood volume flow, (3) rapid fall in the temperature of the limb, (4) temporary or even permanent cessation of the capillary pulsations, (5) marked and sustained decrease in the arterial and venous residual pressure, (6) moderate to severe vasospasm of the entire arterial tree distal to the arterial obliteration, (7) decrease or cessation of the lymph flow, (8) concomitant venospasm, (9) mass of blood in the limb and blood volume flow per minute greatly diminished, (10) interference with the vasa vasorum circulation by arterial vasospasm, and (11) pathological changes within the vessel wall resulting in thromboses. To prevent the ischemic gangrene it is necessary to: (1) test the efficiency of the collateral circulation, (2) develop collateral circulation when found deficient, (3) prevent segmental and diffuse arterial vasospasm, (4) prevent venospasm, (5) increase the blood volume flow through the collaterals and the main vessel distal to the ligation, (6) maintain the capillary pulsations, (7) maintain the lymph flow, (8) increase the peripheral residual pressure, (9) maintain a normal or elevated tissue temperature, (10) increase the blood volume flow through the vasa vasorum, and (11) prevent thrombosis of the peripheral arterioles and capillaries.

The following methods of testing the collateral circulation are advocated: Moszkowicz' test, oscillometric readings, plethysmographic readings and thermocouple readings, and the Matas compressor. Traumatic and embolic lesions of the major peripheral arteries do not allow time for accurate study and testing of the collateral circulation. The methods used to develop a collateral circulation are divided into the following groups: (1) spontaneous, (2) mechanical, including the Matas compressor, intermittent venous occlusion, and ligation of the concomitant veins, and (3) physiological, which include interruption of the sympathetic impulses, which can be accomplished by novocaine or alcohol block of the ganglia or by ganglionectomy. The authors recommend novocaine block as the procedure of choice. The technique of novocaine block of both the lumbar sympathetic and stellate ganglia is described.

The effects upon the peripheral vascular tree following occlusion of the main artery are itemized as follows:

- 1 Spasm of the main peripheral artery
- 2 Spasm of the collaterals
- 3 Low arterial pressure distal to the occlusion
- 4 Decreased peripheral venous pressure
- 5 Increased pressure proximal to occlusion

6. Decreased blood volume flow per minute.
7. Decreased arteriolar pulsations.
8. Slowing and stasis of the lymph flow
9. Decreased flow through the vasa vasorum.
10. Decrease in the number of collaterals through which blood flows.
11. Slow development of the collaterals.
12. Degenerative changes in the vessel wall.
13. Occurrence of thrombosis.
14. Muscle necrosis.
15. Gangrene.

The effects of sympathectomy upon the peripheral vascular tree following obstruction of the major peripheral artery are as follows:

1. Vasodilation of the main peripheral vessels.
2. Vasodilation of the collaterals and increase in number.
3. Return to normal of the arterial pressure distal to occlusion.
4. Return to normal of the peripheral venous pressure.
5. Increased pressure proximal to the occlusion.
6. Sustained increased blood volume flow per minute through the main artery and the collaterals.
7. Increased return of the arteriolar pulsations.
8. Increased lymph flow.
9. Increased number and size of the vasa vasorum.
10. Increased number of the collaterals.
11. Rapid development of the collaterals.
12. Increased blood supply to the vessel wall.
13. Thrombosis extremely rare.
14. Increased blood supply to the muscles.
15. Ischemic gangrene prevented.

Sympathetic block was used to increase the collateral circulation as a preliminary procedure to the ligation of major peripheral arteries in 14 cases. In all but 1 of the cases the collateral circulation as found to be inadequate and in these cases the lesion was in such a location as to prohibit testing with the Matis compressor. The indications for ligation in this series were: 1 case of mycotic aneurysm of the right common iliac artery, 1 case of aneurysm of the femoral artery, 3 cases of aneurysm of the popliteal artery, 3 cases of stenovenous aneurysm, and 1 case of stab wound of the femoral artery. None of these cases, all of which had sympathetic block prior to the ligation of the vessel, developed any signs or manifestations of ischemic gangrene.

The authors also report good results in 4 cases of sudden occlusion of the major peripheral vessels by embolism which were treated by means of sympathetic block. In 3 of these cases the embolus removed following the blocking of the sympathetic ganglia.

In conclusion the authors state: "We believe that sympathetic block not only decreases the incidence of ischemic gangrene but will also lower the immediate mortality." ALFRED B. LOWENBERG, M.D.

Leriche R. The Resection of the Aorto-Iliac Junction with Double Lumbar Sympathectomy in the Treatment of Arteritic Thrombosis of the Aorta (De la résection du carrefour aortico-iliaque et double sympathectomie lombaire pour thrombose artérielle de l'aorte). *Presse méd. Paris*, 1934, 43: 601.

Leriche notes that arteritic thrombosis of the terminal segment of the aorta above the inferior mesenteric artery is probably not as infrequent as is supposed, but it is only rarely diagnosed. It is certainly and still more rarely operated upon. The author has operated on 3 cases in which the diagnosis was definitely established. 1 member of other cases in which lumbar sympathectomy was done the diagnosis was suggested but not definitely established. In these cases, the patient usually first came under observation for one of the following symptoms: sexual impotence in the male due to the impossibility of erection which in turn as due to the diminished blood supply to the corpora cavernosa; weakness and fatigue of the lower limbs without true intermittent claudication; muscular atrophy of both lower limbs, not of as marked degree as the lateral trophic associated with obliteration of the external iliac artery or pallor of the lower limbs even when the patient is standing erect, this becoming very marked (marble hit) if the legs are lifted above the trunk. There were no trophic symptoms in this stage. If an examination for arterial pulsations made, none were found in the leg or the femoral arteries; pulsations of the aorta were not perceptible except above the umbilicus; these findings could be confirmed with the oscillometer. The arterial pressure was slightly increased in the upper extremities.

As the condition advanced, the legs became cyanotic; there was desquamation of the skin and small trophic ulcers that were very painful developed. This was followed by gangrene, usually beginning in the toes. One of the chief factors in this development was the extension of the thrombosis downward and the appearance of peripheral venous thromboses. In the first case operated upon by the author in which the diagnosis of aorto-iliac thrombosis made lumbar sympathectomy was done at the highest possible level, the removal of the first lumbar ganglion on both sides. The patient showed marked improvement after the second operation on the left side and this improvement has been maintained for three years and half since the first operation. While sympathectomy with the removal of the first lumbar ganglion on both sides gave good results in this case in which the aorta as found to be obliterated for from 13 cm. little above the bifurcation, the author considered that better results could be obtained in such cases by resection of the thrombosed segment of the aorta and iliac arteries combined with lumbar sympathectomy. His operation has been done successfully in one case. The patient, a man 40 years of age in whom aortic aneurysm had led to an obliterative thrombosis of the aorta at the level of the third lumbar vertebra. In

this case the terminal segment of the aorta and the thrombosed portions of the iliac arteries were resected and a lumbar sympathectomy was done through a single incision and in one stage. The patient made a good postoperative recovery. The gangrene in one foot subsided, but amputation had to be done on the other side. The author has since lost track of this patient because of war conditions, but the results prove that the combined operation can be done with safety, and that it results in improvement, but it is not always possible to arrest and heal established gangrene.

ALICE M. MILLER

BLOOD, TRANSFUSION

Theil, P. The Determination of Blood Groups, the Beth-Vincent Test and Its Errors, and a Simple Method that Gives Absolute Security. (La détermination des groupes sanguins, l'épreuve de Beth Vincent et ses erreurs, comment peut-on opérer facilement en toute sécurité.) *Presse méd.*, Par., 1940, 48: 594.

Theil notes that in the present war the character of the wounds involves severe hemorrhage and shock, and consequently blood transfusion is of prime importance to the surgeon, for this reason the question of blood grouping is receiving much attention. The most widely employed method of blood grouping—the Beth-Vincent test—while simple and rapidly performed, is subject to definite errors. These errors may be classified as qualitative and quantitative. The qualitative errors are those due to false or non specific agglutination, such as agglutination due to cold or microbial contamination, or pseudo agglutination, which is due to “piling up” of the red cells, one on top of the other, as can be demonstrated by microscopic examination, but which gives the same macroscopic appearance as true agglutination. A control test with AB serum may be made, as pseudo-agglutination is as marked with this serum as with that of Group A, B, or O. Also, dilution or washing of the red cells avoids pseudo agglutination. Quantitative errors occur when true agglutination is so slight that it is not demonstrated by the test, this may be due to too little agglutinin in the serum, or too little agglutigen in the red cells.

In the course of studying many blood grouping tests in the laboratory, the author has come to the conclusion that agglutination can be most accurately determined by microscopic examination of blood that has been diluted, citrated, and formalized. This test has been used as a check on the Beth Vincent test, especially for the O blood group. One or two drops of the blood to be tested are mixed with a solution containing 1 part of sodium citrate and 1 part of 40 per cent formal to 100 parts of physiological saline solution, one drop of normal blood is added to 200 c. cm. of the saline solution, so that the mixture has a slight rose tinge, lighter in color than the 5 per cent mark on the hemoglobinometer of Tallqvist. This suspension of the red cells is kept for a few minutes at room temperature or in the

incubator. Then three drops of the suspension are placed on a glass slide, and one drop of the mixture is added to the first drop, one drop of the mixture to the second drop, and one drop of an O serum to the third drop. The serum and red cell suspension and the O test are mixed with a small styllet and the mixture held in balance for about a minute so as to aid the mixing process. Microscopic examination of each test is then made, this shows the red cells to be clearly separated and no agglutination, or diffuse agglutination. Several portions of each test mixture are examined carefully in order to reduce the chance of error. This test has been found to avoid the errors of the Beth Vincent test. The dilution of the blood to be tested is sufficient to avoid pseudo agglutination, while the microscopic examination of the tests and the method of dilution employed makes it possible to detect the slightest degree of agglutination. After the blood has been citrated and formalized, it can be transported considerable distances before the test is made, and if necessary the rose tint can be removed by further dilution.

ALICE M. MILLER

Clemens, J. Blood Transfusion with the Extracorporeal Transfer of Veten and of the Infusor. (Blutübertragung mit Verwendung des Veten und des Infusors.) *Wortschr. d. Therap.*, 1941, 1: 1.

The author considers the possibilities of the general reactions incident to the transfer of blood clots, clotting substances is prevented. The use of pre-coagulative substances should, from a therapeutic standpoint, be a therapeutic requirement. The author has succeeded in complying with this requirement in collaboration with the manufacturer, using the new preparation of the infusor and a transfusion apparatus (infusor) for the development of his procedure and the infusor, as well as the technique of their application. It comes to the conclusion that the use of the infusor, vetren blood and the fractionated blood, and the fractionated citro vetren blood, and even of sodium citrate represent a marked advance, which has a most important application has stood the test of time.

The advantages of the infusor are the immediate transfer of native blood, direct transfer, and preservation of the blood with the same apparatus. Also the use of the infusor in application with various techniques, such as fractionated transfusion, and the use of the infusor with physiological solutions. The use of the infusor is easily manipulated under the most difficult conditions, by the physician without special training. The blood from the donor flows into the infusor, and, during the transfusion, out of the infusor, passed case. Troublesome filtering is avoided. The conservative manner of the use of the blood permits of widening the application of the infusor, a most important application blood, a most important application blood, in its unchanged state, as a substitute for blood which has been lost or which is not able to function properly, as a substitute for blood.

as an immunity-carrying material, and for nutritional purposes. The apparatus comes to the user in sterile condition and with all the accessories necessary for blood transfusion or for infusion. Thus the patient is assured of immediate treatment, the physician is spared periods of waiting, and preparations may be made at the most favorable opportunity. The apparatus is made of an excellent quality of material whether of probenit or glass, and will withstand boiling or sterilization with dry heat at 150 degrees, will maintain its shape and fill without bumps and knocks incident to handling.

The low conduction for heat and the simplicity of construction make the apparatus easy to set up and assure its technical reliability. The inferior particular that constructed of probenit, limit the development of thrombokinase while the vetren combines with the toxic substances. The method allows of fractionating the blood dosage with regard to amount and to time.

The author is of opinion that with this method the technical and therapeutic problems of blood transfusion have been solved.

(HITCHEM VY-GRUBER) JOHN W. BRYAN, M.D.

Knoll, H., and Maerkl, H. An Experimental Study Concerning Blood Transfusions on the Field of Battle (*Experimenteller Beitrag zur Frage der Blutrtransfusion im Felde*). *Schweiz. med. Wochenschr.* 1939, 744.

The question of blood transfusion on the field of battle particularly on the extreme front lines, has become acute during the past few years. For the past three years the authors have devoted themselves to the task of determining the possibility of blood transfusion under the most difficult circumstances similar to those encountered at the front. The Spanish Civil War has shown that this possibility actually exists and has proved very useful. Regarding the present reports are still lacking.

Transfusion of fresh blood is, indeed, hardly possible in the extreme front lines. In the first place, there is a dearth of healthy donors, because soldiers and personnel of the military medical corps should not be used for this purpose. The possibility of determining the proper groups is also lacking, as well as trained personnel and the necessary apparatus. The surgical ambulatory clinic may well be regarded as the foremost place where transfusion may be possible. The apparatus should be as simple as possible. For this purpose an anticoagulating substance is necessary: heparin or citrat. Heparin has been proved adequate for the use of fresh blood. The advantage of this substance is that it can be stored in small sterile ampoules. The authors are in favor of indirect transfusion. In order to carry this out, an intermediary vessel is needed. The Merke flask has proved best for this purpose.

Transfusion with stored blood is undoubtedly better than transfusion with any of the blood substitutes. The action of stored blood is similar to that of fresh blood. According to the experiences of the

Mayo Clinic complications are even more infrequent. The authors recommend a group of central stations, similar to those established during the Spanish Civil War. They reject the proposal of Hensler to erect blood storage depots close behind the front lines. First, because of the dearth of donors, second, because sterility cannot be adequately observed, and third, because the blood could be stored for only one or two days. On the other hand stored blood which has been bottled at home under every precaution can be used for transfusion from fifteen to twenty days. Duran J. ride, and DeBlasio filled the ampoules under pressure. This has two advantages: (1) an infection can be recognized immediately and (2) the blood can be infused more easily. These authors do not recommend heparin for the stored blood, but rather 5 per cent sodium citricum, in the quantity of 5 c.c.m. to 100 c.c.m. of blood.

The authors then describe their technique for the bottling of the blood in the ampoules. They do not fill the ampoules under pressure because the chemical results are somewhat poorer when pressure is used. The danger of infection is not great. The blood should be stored at a temperature of +4 C. and should be heated slowly to 37 C. just before using. Lower as well as higher temperature results have a tendency to hasten hemolysis. Further hemolysis is hastened as a result of shaking the blood. This fact is of importance in the transportation. The authors have succeeded in transporting blood by railway by tomobile and by pack saddle on horses. The method of packing should be read in the original article. It is found that with their method of packing, hemolysis did not occur even when the material was transported by galloping horses. A small rubber pump as fitted to each ampoule is ordered to maintain an even temperature, every cook's boxes containing refrigerating mixture proved to be adequate.

The arguments against the use of stored blood on the battlefield do not hold water. The only difficult matter is that of organization, but even that easier than one might usually assume beforehand. The authors then describe the technique for Swiss land.

At the front line of battle transfusion of stored blood is the only type that comes into question (1) because this can be carried out by one person in the most simple manner even under the most difficult circumstances, and (2) because determination of the proper blood group is unnecessary. The Spanish Civil War has shown that the blood from the normal donor is adequate.

(FRANK HALL) A. SALVE, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS
King, E. S. J. and MacCallum, P. The Development of Lymph Nodes. *J. F. C. Australian & New Zealand J. Surg.* 1940, 26.

The surgical practice has apparent increase in the number of lymph nodes is frequently observed in

region where these drain an organ or tissue affected by inflammation or new growth. Although it is agreed by some that this is an actual new formation of the lymph nodes, others consider that minute lymph nodes already present merely become sufficiently large to be easily apparent. This second view is possibly the more commonly accepted hypothesis.

The examination of a number of specimens removed at operation led the authors to conclude that new lymph nodes are formed, and almost invariably these arise in fatty tissue. Regeneration or new formation of lymphoid tissue is to be expected when one considers the almost universal regenerative capabilities of tissues in the body. The formation of new lymph tissue in fat only is considered herewith.

The evidence for the new development of lymph nodes is of three kinds: (1) clinical study, together with gross operative findings, (2) histological examination of pathological material, and (3) experimental observation.

The clinical observations include the recurrence of lymphatic nodes after their removal, the increase in the number of lymph nodes in regions involved by tuberculosis, Hodgkin's disease and malignant tumors, and the discovery of lymph glands in unusual locations following acute infections, as well as in pregnancy and lactation.

In histological examination, all gradations between lobular fat and a complete lymph gland may

be observed in one area. The conclusion that the various conditions observed indicate stages in the development of lymph nodes would not necessarily be justified if made from this alone. In some cases a single nodule, which has developed under observation, is found in a mass of fat with a small amount of peripherally situated lymphoid tissue. Also, if, in areas showing the numerous gradations, it is assumed that fatty change has occurred in the lymph nodes, it necessarily follows that, since some of the masses are entirely fatty, a much greater number of lymph nodes than could reasonably be expected to be present must have been in the region originally.

The experimental work is of two kinds: (1) the determination of regeneration in a damaged lymph node, and (2) the observation of new lymph nodes.

In conclusion, these workers note:

1 Lymph nodes which drain an area in which there is inflammation or new growth are more apparent and more numerous than in normal circumstances.

2 All gradations may be found between fat lobules and lymph nodes.

3 Lymph nodes may be found, in both experimental and clinical conditions, in situations where they are normally absent.

4 The combined evidence, clinical, histological, and experimental, indicates that lymph nodes often arise in fat tissue.

HERBERT F. THURSTON, M.D.

THE CHEMICAL PATHOLOGY OF BURNS

Collective Review

CONRAD R. LAM, M.D. F.A.C.S. Detroit, Michigan

THE importance of the treatment of the patient as a whole in the therapy of burns has been emphasized so much by recent authors that it seems trifling to mention it again in the opening paragraph of this review. For example, McClure (42) stated "Disagreements regarding the proper local treatment should not distract our attention from the more important problem—the treatment of a very sick patient who has a threatening toxemia, alterations in the blood chemistry, a wound very susceptible to infection and pathologic changes in organs remote from the skin. In this country surgeons have assumed the cure of burns, although not always enthusiastically. However, it is difficult to think of a clinical entity in which the patient is more in need of the 'metamorphosed' surgeon described by Naefziger (45) the surgeon who has a usable knowledge of modern physiology, biochemistry and other basic sciences.

An extensive review of the entire subject of burns by Harkins (25) appeared in 1938. The present review seeks to assemble the significant contributions of the past five years to the chemical and physicochemical part of the burn problem.

WATER BALANCE

Almost invariably the first and only request of the burned patient in the emergency room is for a drink of water. This is evidence of the earliest and simplest of the physicochemical changes, alteration in the fluid/solid ratio, i.e. dehydration. The principal cause of this is the loss of water along with other plasma components, into the tissues which are becoming edematous at the expense of intravascular water. In addition, some water is lost externally as a special effect of the burn. Theoretically with flame burns some water might be vaporized as steam at the instant of injury. This is almost certainly negligible although in Harkins (26) experiment on the rate of fluid shift the burned side became lighter for a brief period (Fig. 1). Temporary constriction of the arterioles as a result of the irritating stimulus could have produced this difference in weight.

From the Division of General Surgery of the Henry Ford Hospital, Detroit, Michigan

The rate of evaporation from burned surfaces was investigated by G. S. McClure (41). An apparatus was devised so that dry air could be passed over an area of skin, and the amount of moisture picked up could be measured. He found that the rate of evaporation from burned surfaces was two and one half times that of normal skin but a tannic-acid eschar almost completely inhibited evaporation. If one assumes a normal loss of 1 liter of water per day from the skin, an untreated burn of one third of the body surface would cause an additional loss of approximately 500 c.c.m.

In addition to the special demand of the burn for water the usual needs, namely water for urine and insensible loss through the lungs and skin, must be kept in mind. This phase of the problem has been dealt with by Collier and Maddock (12). The higher figure for insensible loss, namely 1,000 c.c.m., would apply because of the fever which accompanies the burn. A daily output of urine of at least 1,500 c.c.m. should be obtained as soon as possible and if amounts of from 3,000 to 4,000 c.c.m. are obtained during the first five days, it is a favorable prognostic sign. Another source of loss of fluid is vomiting, and amounts lost in this manner should be replaced with normal saline solution administered intravenously.

It must be borne in mind that plain water must be supplied to fill the demands for insensible loss and urine and not to replace the protein-containing plasma which has left the blood stream and made the blood concentrated, with high hemoglobin and hematocrit values. For this purpose plasma itself should be used as will be discussed later. Trusler and his associates (57) have presented impressive case reports and experimental data to show the danger of adding water to the existing injury. They described the case of a two-year-old child who was treated with large quantities of crystalloid fluids. Generalized edema appeared, and the child died in convulsions. The blood chloride level just before death was 4 mEq per cent. These investigators conducted animal experiments and found that excessive amounts of saline solution given intravenously and of water given by mouth

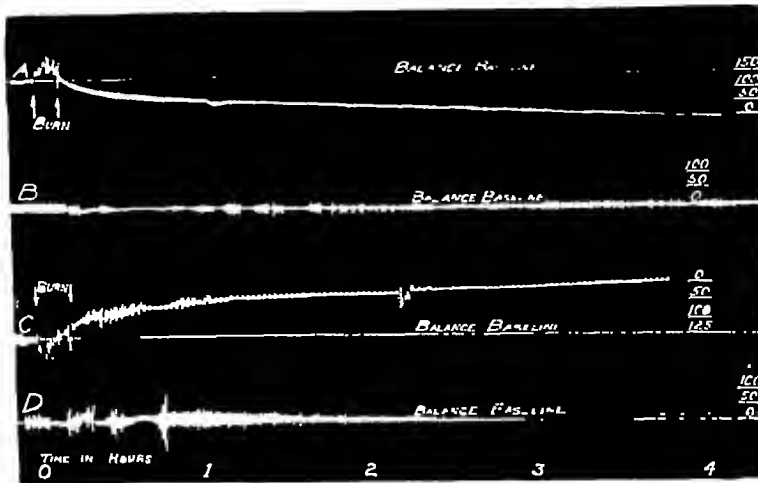


Fig 1 Kymograph tracings obtained in the experiments of Harkins (26) on the rate of fluid shift in burns A, burn experiment, B, control experiment C, burn experiment, and D, control experiment In A the burned side is away from the drum, so that the shift to the burned side causes the recording point to move downward In C the burned side is toward the drum and the shift causes the recording point to move upward The calibration figures on the right represent grams The animals weighed 6.3 kgm and 5.2 kgm respectively, in experiments A and C (From *Arch Surg*, 1935, 31: 71)

have a deleterious effect. They stated that repeated blood transfusions and the administration of moderate quantities of fluid with dextrose and salt constituted the treatment of choice. Minot and Dodd (46) have also warned against the use of crystalloid solutions when a protein-containing fluid is needed.

Water, *per se*, therefore is necessary only for loss by evaporation and for the secretion of urine, and a daily intake of from 3,500 to 4,000 cc may be sufficient. This may be drunk by mouth, preferably in the form of fruit and vegetable juices with added salt. If there is vomiting, the fluid will have to be given intravenously in the form of a 5 per cent solution of dextrose with normal saline solution. The amount of saline solution which should be given will be discussed under the heading of chlorides.

LOSS OF PLASMA AND PLASMA PROTEINS

It is now well established that the blood concentration of burns and probably many of the shocklike symptoms of burns are due to the leakage of plasma through the capillaries into the tissues at and near the burn, as well as tissues remote from the injury. This results in a loss of blood volume which is considerable. Blalock (8) burned one side of an experimental animal, later bisected the animal, and noted an average difference of 3.34 per cent of body weight. Harkins

(26) varied this experiment, placing the animal on a balanced trough, which tipped as one side became heavier, and a recording was made on a drum. He found that half of the shift took place in one hour. The average shift before death in his animals was only 2.2 per cent.

Moon (47) believes that Blalock and Harkins have overestimated the importance of the fluid which accumulates at the site of injury. He stated, "Experiments of this type include a factor of error which was not taken into account. As fluid escapes from the blood into the tissues of the affected side, fluid is simultaneously absorbed from the tissues of the normal side thereby decreasing its weight. Suppose 100 gm of fluid were so shifted, the difference in weight of the two sides would be 200 gm, but the actual gain of the affected side would be only 100 gm." Moon believes that hemoconcentration is significant in shock and burns, but that most of the fluid loss is general, and occurs in tissues distant from the burn.

In his rebuttal to the criticism of Moon, Harkins (28) points out that the factor of error mentioned by that author would be present only if the entire half of the animal were burned. If only one-sixth of the tissue of the body were burned, the error would not be more than 20 per cent because two-thirds of the treated side is also normal, and would share in the theoretical weight loss of the normal side.

Harkins (27) made observations on the bleeding volume in burns (the amount of blood which will flow out of the carotid artery). Control animals bled 53.4 per cent of the calculated blood volume; animals burned and bled before the blood pressure was greatly lowered bled 31.4 per cent, and animals bled after the blood pressure was below 60, bled only 16.3 per cent of the blood volume.

Keeley, Gibson, and Pijoon (33) studied the changes in plasma, cell, and total blood volume and other chemical changes in a series of 7 dogs. Observations extended over a period of from eight to ten hours after the burn. Plasma and blood volumes were determined by the method of Gibson and Evans. Marked reduction of plasma volume was noted, from 2.5 to 60.7 per cent. Four of these animals had been splenectomized previously. Three of these showed a decrease in the circulating red-cell volume of 7.8 per cent, 13.1 per cent and 27.8 per cent, respectively. The non-splenectomized animals had an increase in red-cell volume of 59.5 per cent, 24.6 per cent, and 22.3 per cent. The serum protein concentration remained fairly constant, because in these acute experiments, with no fluid being supplied, there was little or no tendency toward replacement of the lost plasma by dilution of the remaining plasma with other fluid.

In the treated human case adequate or excessive fluids are given by mouth or parenterally and a dilution of the plasma proteins occurs in a day or two. Wetner, Rowlette, and Elman (60) reported a series of 40 burns and low serum-protein values were encountered, as low as 4 gm. in some cases. These writers advised that plasma rather than whole blood be given when there was protein deficiency. Whole blood and plasma transfusions were used by McClure (43, 43), Trusler, Egbert, and Williams (57), McClure and Lam (45) and Elkinton (19) (Fig. 1).

Elkinton, Wolff, and Lee (20) have recently made a significant contribution to burn therapy by devising a formula for use in the quantitative replacement of plasma deficits. The statement of McClure and Lam (45) in April, 1941 that "the indications for blood and plasma transfusions are not well defined at the present time" may no longer be true. The chief assumption in the formula of Elkinton, Wolff, and Lee is that the volume of the circulating red cells remains the same and that changes in the hematocrit reading after burns are due entirely to changes in the volume of the circulating plasma. This assumption is valid in the light of some of the results of Keeley, Gibson, and Pijoon (33) who found apparent increase in the volume of circulating

red cells of 59.5 per cent in one instance! However it may be that the volume of circulating red cells in the human being is constant enough for application of the formula, at any rate the formula seems to work well when applied clinically. The formula is as follows:

$$\text{Plasma protein deficit in grams} = 3.5 \frac{W(100-H_0)H_0P}{s(100-H_0)H_0}$$

W is the weight of the patient in kilograms, H_0 is the observed hematocrit, H_n is the normal hematocrit (44), and P is the observed plasma protein concentration in grams per cent. To convert grams of protein into cubic centimeters of plasma, one multiplies by the factor 14.

The application of this formula shows that there is a surprisingly large loss of plasma volume with a moderate increase in the hematocrit reading. For example an increase of the hematocrit reading from 44 to 57 per cent indicates a loss of 41 per cent of the original plasma volume! In supplying this deficit, one may give 1,500 c.cm. of plasma to a patient with burns of the face and arms; a severe burn of the lower extremities may need from 2,500 to 3,000 c.cm. Elkinton, Wolff, and Lee believed that there is no further loss of plasma after the fortieth hour; the capillaries having regained their impermeability.

The fact that blood banks are becoming more common makes it easier to supply plasma in large amounts. Lehman (36) suggested that the supernatant plasma be pipetted off after the cells had settled out. Strumia, Wagner, and Monaghan (56) have outlined in full the procedure for the use of fresh and preserved plasma. They used plasma in 1,500 transfusions without a reaction. 7,300 c.cm. were given in eleven days to a patient with burns. Hill and his associates (29) used desiccated plasma in the treatment of 6 burn cases. Water was added to the dried material to make a four fold solution. Fifteen doses averaging 89 c.cm. of the concentrated plasma were given to the 6 cases.

There is great interest in the use of plasma in England as revealed by war casualties. Black (7) gave a detailed report of the treatment of 8 burned patients, 7 of whom showed clinical shock. Three infusions of four fold serum in amounts from 150 to 300 c.cm. and 6 infusions of plasma in amounts from 500 to 1,000 c.cm. were given to 7 patients. One patient with a burn of 50 per cent of the body surface showed no beneficial effect, while the other eight infusions were all followed by definite in some cases, dramatic im-

provement Black submits the following formula as a means of calculating the plasma deficit

$$\frac{Hb}{100} = \frac{5}{(5-x)}$$

Hb is the observed hemoglobin percentage and x is the plasma deficit in liters

This formula assumes that the patient had a hemoglobin percentage of 100 before the burn and a blood volume of 5 liters. Its chief deficiency lies in the fact that it does not take into account changes in the plasma protein concentration. For example, 1 of this author's patients had severe burns of both legs and died on the fifth day. The hemoglobin percentage on four successive days was 116, 114, 122, and 98, respectively. On the first day, the patient was given 1000 ccm of plasma. Theoretically, on the basis of the author's formula, adequate proteins had been supplied when the hemoglobin fell to 98 per cent. However, on the day of admission, the plasma protein concentration was only 4.2 gm per cent and on the next day had fallen further to 3.5 gm per cent, or little more than half the normal concentration and below the edema level.

Brown and Mollison (10) treated 5 cases of burns with the dried serum prepared at the Medical Research Council drying unit at Cambridge. They found it to be non-toxic and its use in the treatment of shock was followed by successful results.

In a recent article, Lham (21) reviewed the evidence for the generous use of plasma in burns, and presented further case reports. He pointed out that in 1881, Fappener wrote that the concentration of blood in burns occurs not through simple water loss, but by the loss of fluid of such the composition is close to that of blood plasma and he recommended the use of transfusions of serous fluid.

Not infrequently, there is a reversal of the albumin/globulin ratio of the plasma proteins. Normally this ratio is about 3 to 2. A reversal is noted in 3 of 8 cases reported by McClure and Lam (45) and in the case of Lucido (45). This injury may have some relationship to the liver injury which frequently occurs in severe burns, as will be discussed later. Identical changes in the composition of the plasma proteins have been observed in various diseases of the liver parenchyma by gastro-enterologists (59). Another possibility is that the smaller albumin molecules escape from the capillaries more easily.

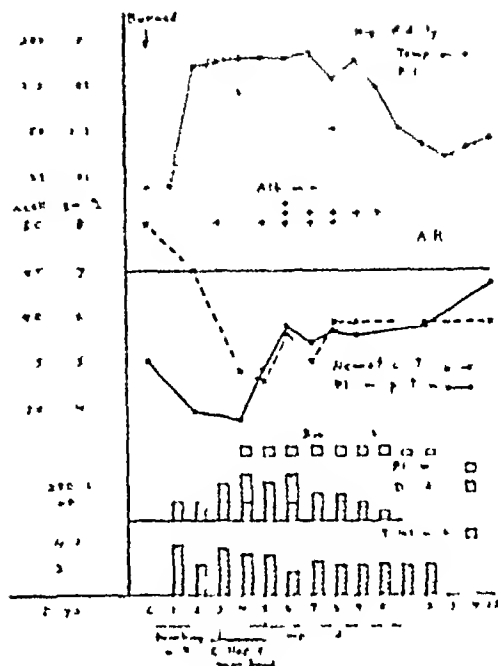


Fig. 1. Clinical chart of twenty-five month old child with second and third degree burns of the entire back and most of the chest and abdomen, reported by Hinton (10). This illustrates the marked plasma protein loss in the presence of hemoconcentration with satisfactory response to plasma and blood transfusion. (Reproduced with the permission of the Editor of the *Bull. Amer. Clin. Lab. Pers. Hosp.*)

CHLORIDES

There is disagreement regarding the behavior of the blood chlorides in burns. Davidson's (14) early observations that there is a significant lowering of the whole blood and plasma chloride have not been well substantiated. Some of the confusion is undoubtedly due to the fact that most clinical cases are treated with saline solution given parenterally, and the defect may be corrected before it is apparent. Both Davidson and Harkins (28) have emphasized that since the cells contain less chloride than the plasma, in the case of the hemoconcentration of burns, examination of the whole blood would give a lowered chloride value, while the concentration of chloride in the plasma might be the same. However, a blood concentration of 70 per cent hematocrit would reduce the sodium chloride content of whole blood only from 500 to 459 mgm.

In the acute animal experiments of Keeley, Gibson, and Pujon (33), the serum chlorides were determined in 6 dogs. Three showed little

change in the serum-chloride concentration showed elevations of about 50 mgm. per cent, and 1 showed a decrease from 641 to 473 mgm. However since there was a great decrease in the amount of circulating plasma the total amount of salt in the circulating blood was reduced proportionally. Perez (49) produced burns in rabbits and noted the change in the chlorides of the plasma and cells after one hour. Scalding caused a decrease of 11.7 per cent in the plasma chlorides and 1.5 per cent in the cell chlorides. Acid burns caused 8.7 per cent and 6.8 per cent decreases for plasma and cells, respectively, and alkali burns, 20 per cent and 6 per cent, respectively. To compute the percentage decrease in whole blood, the author added the figures for plasma and cells, e.g. 16 per cent for alkali burns. This is erroneous, of course. Assuming hematocrit reading of 50 per cent, the percentage decrease for whole blood would be 8 per cent in this case.

Wilson and Stewart (63) studied the blood chemistry in 41 patients most of whom were children. In 20 cases showing lowered serum sodium the blood sodium-chloride averaged 513 mgm. per cent with a range from 430 to 693 mgm. per cent. The usual change was an increase. Stenger (55) studied 6 burned children and found a decrease in chlorides in all 6 cases. Several French writers reported hypochloremia in burns and believed it to be important (4, 16, 35). It is thought by some that there is general chloride retention, such as occurs in pneumonia. Some of the chloride is to be found in the edematous areas. The excretion of chloride in the urine is suppressed in the early days following burn.

From the above studies, it would appear that the chloride loss in burns is not large or significant. Moderate parenteral doses of saline solution (from 500 to 1,000 c.cm. daily) or even the salt in the diet will take care of the chlorides lost into the edema fluid of the burn and in the urine. If there is vomiting the vomitus should be measured and replaced with saline solution according to the usual surgical principles. If for any reason blood-chemistry determinations show a low chloride level, replacement may be made according to the formula of Collier and Maddock (12). These authors advise that 0.5 gm. of salt per kgm. be given for each 100 mgm. of lowering of the plasma chloride value below the normal 500 mgm. per cent. It should be emphasized again that large amounts of saline solution should not be given without indication. If excess chloride is given, it must be excreted by the kidneys along with part of the water and nothing is gained.

BASIC ION

Sodium. Investigators agree generally that there is a decrease in the serum sodium after burns. Perez (49) found the sodium down from 41.0 per cent in rabbit experiments. Extensive studies on clinical cases have been made by English investigators. Wilson and Stewart (63) studied 4 cases and found the serum sodium below 300 mgm. in 15 cases, between 300 and 320 mgm. in 18 cases, and above 320 mgm. in only 8 cases (normal—370 mgm.). Lowdon and his coworkers (37) did experiments to trace the sodium. Scalds were produced in cats by immersing the hind limbs and posterior third of the trunk in water at 90 degrees for 5 seconds. After this, the level of the sodium in the serum of the arterial blood and cerebrospinal fluid steadily declined, while the sodium in the red cells tended to increase. These changes were not prevented by section of the spinal cord, decerebration, or removal of the kidneys or of the suprarenal glands. The following facts suggested that sodium was being lost into the scalded tissues: (1) there was no significant fall in the serum sodium if the circulation to the scalded area was occluded before the scalding; (2) the serum of the venous blood from scalded skin contained less sodium than the serum of the arterial blood; and (3) perfusion with heparinized blood of the isolated hindquarters showed a consistent loss of sodium from the plasma of the perfusate. Wilson and Stewart (61) studied the action of the synthetic hormone desoxycorticosterone acetate. They concluded that this substance rapidly restored the normal sodium level of extracellular fluids and corrected other blood abnormalities. It also had an occasional effect in improving circulatory efficiency during secondary shock and the acute anemia of burns.

Potassium. In their experiments, Keeley, Gibson, and Poon (33) found no change in the serum potassium concentration in burns. Stenger (55) series of 6 children, there were 4 instances of elevated serum potassium, the highest being 54.2 mgm. per cent. In 20 cases studied by Wilson and Stewart (61) the average value for the serum potassium was 27 mgm. the range being from 23 to 34 mgm. McClure and Lam (45) did not note significant potassium changes (Fig. 3). In his book on "Shock," Scudder (54) records the results of potassium determinations in 6 cases of burns. In 4 instances, there was elevation of the serum potassium to 5 mgm. per cent, but there was no evidence that the hyperkalemia was related to the degree of shock or the prognosis. This author did use the generous use of adrenal extract (teichatin) and hypertonic sodium chloride

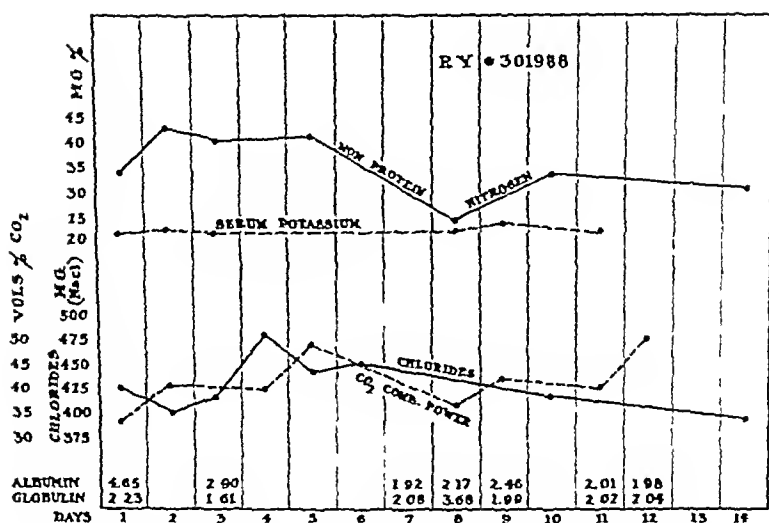


Fig 3 Chart showing the blood chemistry findings in a patient with severe burns of the lower extremities (From McClure and Lam *South Surgeon*, 1940, 9 223)

solution in burns and other surgical conditions accompanied by shock.

Calcium In several clinical cases, Wilson, MacGregor, and Stewart (62) found no significant change in the serum calcium. In the rabbit experiments of Perez (49) there was an increase in the calcium from 6.7 to 24.4 per cent.

Magnesium One investigator (Mattina 40) observed the blood magnesium in 6 rabbits and found it was increased after twenty-four hours, reached its maximum in ten days, and returned to normal in forty days. Magnesium is much like potassium in that it is an intracellular rather than an extracellular electrolyte, and slight increases would be expected to accompany the slight hypokalemia.

ACID-BASE BALANCE

The carbon dioxide combining power of the blood was examined in several of the cases reported by Wilson, MacGregor, and Stewart (62). Values of from 40 to 70 vols per cent were observed. In a case studied by McClure and Lam (45), a value of 33 vols per cent indicating a moderate acidosis was observed (Fig 3). The writer has seen higher grades of acidosis, with carbon dioxide combining power values from 20 to 25 vols per cent in fatal cases especially in children. No bacteriologic results were ever observed when sodium bicarbonate was given to some of these patients. Up to this date the writer has not encountered a report of pH studies of the blood in burns.

NON-PROTEIN NITROGEN

Moderate to marked increase in the blood non-protein nitrogen is common in burns. In general, there is an inverse ratio to the urinary output. High terminal values are seen with the complete anuria of some cases. Another factor may be the addition of certain nitrogenous bodies as a result of the destruction and absorption of burned tissues. In their animal experiments, Trusler and his associates (57) obtained values as high as 167 mgm per cent. In 20 cases, Wilson and Stewart (63) noted an average value of 56 mgm, with a range from 40 to 81 mgm. In several cases, Lambret and Driessens (35) studied the components of the non-protein nitrogen. There was elevation of the blood-urea nitrogen and polypeptide nitrogen which showed a rough parallelism. In 2 instances, there was slight increase in the amino-acid nitrogen.

In clinical practice, the duly determination of the non-protein nitrogen serves as a valuable index to the prognosis.

BLOOD SUGAR

The French writers have described hyperglycemia, which they attribute to excessive adrenalin secretion in the first stages of the burn (35). Wilson and Stewart (63) noted an average blood-sugar level of 105 with a range from 99 to 116 in 20 cases. The blood sugar values in the experimental animals of Trusler and his associates (57) varied with the type of therapy which the animals received.



Fig. 4. Photomicrograph of liver tissue removed from patient who died on the third day following severe burns of 50 per cent of the body surface. All of the liver cells except those in the lower right hand corner show marked degeneration. (From McClure and Lam. *South Surgeon*, 944, 9-3)

JAUNDICE AND LIVER INSUFFICIENCY

The frequency of jaundice in the course of severe burns has been stressed by Wilson, MacGregor and Stewart (62), McClure (43) and McClure and Lam (45). The first writers stated, "With increasing experience we have come to regard jaundice as one of the signs of acute toxemia rather than a complication. It was noted in 1 of the cases of the series (65 cases) and would probably have been detected more frequently in the earlier part of the investigation had its importance been more fully realized. Jaundice was found during fulminating toxemia even as early as 48 hours after injury, but the more pronounced jaundice occurred in the slowly progressive low grade toxemia of adults, appearing usually about the fourth day. It was certainly not related to any special therapeutic measure since it appeared under many modifications of treatment and was found in one late admission in which the burns had received no special treatment beyond the application of oil. Nor was it dependent on the sepsis, since in most instances, the presence of sepsis in the burned area was excluded. Jaundice indicated the occurrence of degenerative and necrotic changes in the liver."

McClure (43) told of "men who were burned in the same fire. One died on the third day and

at autopsy the liver showed widespread necrosis" (Fig. 4). The other survived, but developed a tender liver and a "icterus index of 130 units. The patient in the case reported by McClure and Lam (45) had an icterus index of 50 units on the fourth day and recovered (Fig. 5). Large quantities of glucose were given to aid in the regeneration of the liver. Belt (5) made autopsies on 4 cases of burn and found widespread liver necrosis in all. The histological appearance was similar to the changes found in yellow fever. Buis and Hartman (11) describe the changes in the liver in 5 cases of burns. They suggest that anoxia associated with shock, plasma loss, and hemoconcentration are the principal causes of the liver necrosis.

In addition to the jaundice tests of liver function shown by the liver in burns. The case reported by McClure and Lam (45) showed impairment of liver function as judged by the hippuric acid and galactose tolerance tests and a low plasma prothrombin was observed. Recently Wolff, Elkinton, and Rhoads (64) made extensive studies on the liver function in 3 cases. They made observations on the bilirubinemia, bromsulphalein retention, hippuric acid output, plasma prothrombin concentration and dextrose tolerance. Their results indicated that hepatic damage was present, especially during the period from the third to the tenth day following the burn.

THE TOXIN OF BURNS

The extensive liver necrosis described above has been cited as evidence in favor of the toxic theory of the cause of death in burn. Wilson, MacGregor and Stewart stated (61). "In summarizing we may affirm that after death from burns, a lesion of the liver cell was found in many cases which was characteristic of this form of injury. Its relation to acute toxemia was so remarkably close as to leave little doubt that the liver lesion and the acute toxemia were produced by the same mechanism. The responsible agency was certainly not bacterial infection, and, in our view, the liver lesion furnished the strongest indication of a non-bacterial toxin circulating during the first few days after a burn."

It is beyond the scope of this review to analyze the large mass of conflicting data which has accumulated on the problem of the toxin of burns. The status of the problem will be presented by calling attention to some of the more recent work.

There is some debate on the matter of whether or not a burned surface is efficient for absorption. Elkinton (60) cites the work of Underhill and his coworkers, in which it was shown that strychnine

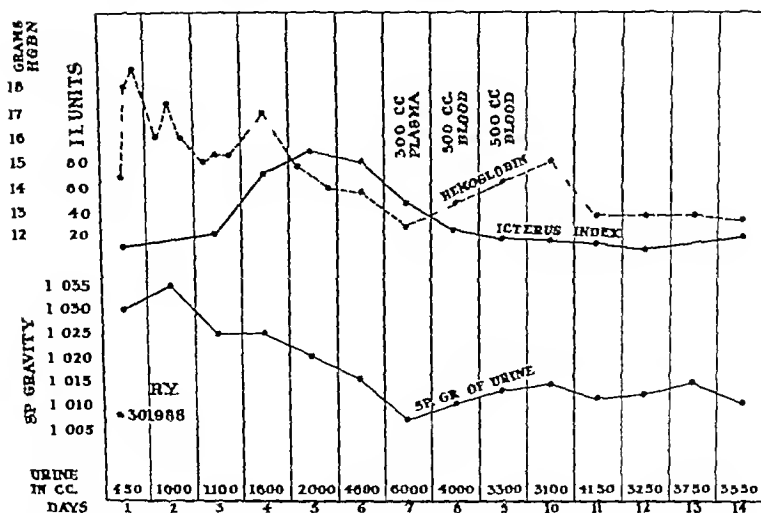


Fig 5 Chart showing behavior of hemoglobin, icterus index, and urinary output during the first two weeks of burn (From McClure and Lam *South Surgeon*, 1940, 9: 223)

and dyes were poorly absorbed from burned tissues. Mason, Paxton, and Shoemaker (39) injected potassium iodide into burned tissue and normal tissue, and found that there was no difference in the rate of subsequent excretion in the urine. They concluded that a readily diffusible substance of low molecular weight, such as potassium iodide, is absorbed from burned areas. They also added that death occurring several days following severe burns is due mainly to the absorption of protein decomposition products. Arnaud (1) treated 9 burns with mercurochrome dressings, and nephritis and other symptoms of mercurial poisoning appeared. After twenty-seven hours, mercury was excreted in the urine. In his comment on the report, Graham (23) warned against the use of mercurial antiseptics in such wounds. Hooker and Lam (30) found that sulfanilamide was readily absorbed from burned surfaces. Blood levels of 10 mgm were easily obtained by sprinkling the powder on small areas of the forearm. Hence, the available evidence indicates that if a harmful substance is formed at the site of the burn, it is apt to be carried in the blood stream to other parts of the body.

Harkins (25) lists 20 substances which have been suggested as the toxin of burns. Protein decomposition products are blamed most frequently. Davidson (13) suspected the toxic rôle of these products and originated the tannic-acid method of treating burns with the idea of changing a large part of the necrotic tissue into insoluble protein tannate. Of course, it is now well established that

tannic acid alone will not prevent the typical burn death. Several French writers (17, 18, 35) believe that intoxication with polypeptides is important. Duval, Roux, and Goffion (18) stated that the average amount of polypeptides in the blood is normally not over 20 mgm per cent and in the urine not more than 10 mgm per cent (figures expressed as tyrosine). They stated that in burns, a large amount of tissue is suddenly destroyed and large amounts of polypeptides enter the circulation. Hyperpolypeptidemia was demonstrated as early as six hours after burns and the authors believed that the gravity of the clinical picture was paralleled by the increase in concentration of these split proteins. It was felt that these substances produced multiple visceral lesions. Harkins (38) suspected that the French investigators were overly enthusiastic in this matter, but suggested that the theory should be carefully checked before being put in the discard.

An extensive review of the German literature was given by Guenther (24). He described changes in all the organs, and stated that the injury to the skin is important only because of the amount of toxic products created. In his summary, he stated that the clinical picture which follows burns is that of circulatory collapse of an acute or protracted nature. Its anatomical basis is a hyperemia, slowing of the circulation and stasis in the various organs. There is an accompanying increase in the permeability of the endothelium for constituents of the blood. This leads to exudation of plasma and erythrocytes, which

produces changes in the organs which vary from serous inflammation to total necrosis. He compared the heart in burns to the toxic heart in diphtheria and pointed out that cardiac damage results in a vicious circle since pure cardiac insufficiency may be added to the general circulatory disturbance.

Globus and Bender () described a case of disseminated degenerative encephalopathy which occurred in a case of burns. They believed it was on a toxic basis, a toxic intoxication from broken down proteins. Since toxic symptoms did not appear until six weeks after the burns and death did not occur until six months after it would appear that the case should be regarded as one of chronic sepsis rather than one succumbing to burn toxin. Brenner (9) reported autopsy findings in a four-year-old child who died following a small burn of the left hand. Unusual inflammatory changes occurred in the heart muscle, liver and kidneys. There was severe damage to the vessels in all the organs. The author stated that it was the consensus of opinion that these changes are due to the toxic substances from proteins. Harkins (25) criticized this interpretation, stating that since the death occurred on the seventeenth day it was probably due to infection.

The theory that the toxemia of burns is due to histamine intoxication is an attractive one, and several investigators have searched for histamine in the burned skin and in the blood of burned subjects. Barnum and Gaddum (2) studied 5 cases of extensive burns, and found the blood histamine to be increased four fold. This elevation did not parallel the clinical condition of the patients. Harard and Martin (34) criticized previous reports of histamine assays. They prepared assay solutions from the blood of normal and burned dogs, and noted their effect on the blood pressure of the cat. They concluded that the fall in blood pressure caused by these solutions was not due to histamine but was possibly due to a split product formed from the blood during the preparation of the assay solution. An albumin-extract solution produced the same type of fall as that which was produced by the assay solution prepared from the dogs' blood.

Rosenthal (51, 52) searched for a histaminelike toxin in the blood of burned pigs, guinea pigs, and human beings, and found a substance which contracted the virgin guinea pig uterus. This substance was first linked with the red cells, but later with the serum. It differed from histamine in that it was heat labile and did not act upon the guinea pig uterus under certain conditions in which histamine did. In his second report this author

presented the results of his investigations on the possible formation of antibodies. He concluded that there were indications that the serum of beaked pigs and human beings contained substances which neutralized histamine and burn toxin, as indicated by the action of the mixture on the virgin guinea pig uterus. Normal serum also neutralized histamine and burn toxin to a limited extent but only at incubator temperatures.

Bernhard Kreis (6) gave an extensive review of the literature on histamine and its relation to shock, burns, anaphylaxis, and other conditions. He conducted a series of experiments in which extracts of skin and muscle were injected into guinea pigs and rabbits. He could only rarely demonstrate histamine in his extracts. He used two types of extract, one being simply an aqueous extract of tissue and the other being boiled for two hours. Presumably the latter was to represent burned or scalded tissue. At the end of the experiments, autopsies showed changes in the livers almost identical with those described in clinical cases of burns (4, 62) (Fig. 4). However his experiments were continued over a period of four months, injections being made twice weekly. The animals given the plain extract showed more changes in the liver than those given the heated extract. This experiment would appear to furnish little help in the problem of the cause of death in acute burns.

Wilson, Jeffrey Roeburgh, and Stewart (61) investigated the toxicity of edema fluid from burned tissue. They concluded that this fluid gradually acquires toxic properties and when collected after forty-eight hours, it may be fatal to animals of the same species. Autolysis of injured tissue was believed to be responsible. Toxic effects observed were changes in the nervous system, circulatory depression and degeneration of the liver cells. The toxic principle seemed to be linked with the globulin fraction.

A Japanese investigator Ishizawa (32) did experiments with rabbits and was impressed with the possibility that hemoglobin poisoning may be the cause of the early toxic manifestations. He stated that rabbits injected intravenously with hemoglobin solutions prepared from their own or other blood died within a few hours, sometimes with convulsions. He burned rabbits and noted free hemoglobin in the plasma of some of the early blood specimens and hemoglobinuria in some cases. Harkins (25) criticized this work, pointing out that the occurrence of hemoglobinemia appeared to have no relation to prognosis in the experimental animals.

In summarizing the evidence regarding a specific burn toxin, we may say that the matter is still *sub judice*. The experimental methods are such that artifacts are prone to be produced and errors of interpretation are frequent. Competent investigators are unable to reproduce the results of other competent investigators.

If one chooses to be "toxin conscious" in the therapy of burns, there are several rational methods of treatment which suggest themselves. The hepatitis, whether toxic or not, may be treated with large amounts of glucose, given by mouth and parenterally. Adequate diuresis will permit of the possible excretion of toxic products. The exsanguination-transfusion method of treatment was used by one German author (3). If one believes that histamine poisoning is present, the use of histaminase presents itself for consideration.

CHEMISTRY OF BLISTER FLUID

Harkins (28) analyzed blister fluid in 2 cases. In one case, the total protein was 3.4 gm per cent, the non-protein nitrogen 22.2 mgm, the sugar 58.3 mgm, and the sodium chloride 600.2 mgm per cent. In another case the total protein was 3 gm, and the sodium chloride 600 mgm per cent. Thus, the proteins were about half that of plasma, the sugar about half, and the chloride and non-protein nitrogen were about the same as the plasma.

Hughes (31) performed an interesting experiment to determine the immunological properties of blister fluid. Four groups of 10 mice received 0.1 minimal lethal dose of streptococci mixed with 4 types of fluid. When the organisms were injected with normal human serum, 8 mice remained well, 1 mouse became sick, and 1 died. When injected with pleural exudate, 5 mice died, 3 became sick, and 2 remained well. With hydrocele fluid, 1 mouse became sick and 9 mice remained well. When the streptococci were injected with blister fluid from a burn, 9 mice died and 1 mouse showed morbidity.

URINE CHANGES IN BURNS

The chemistry of the urine has not received the attention in burns that has been given the blood. The high specific gravity associated with the oliguria is well known (Fig 5). Albuminuria is almost the rule. Ketonuria, hemoglobinuria, and bilirubinuria are merely evidence of excess of those substances in the blood stream. The French writers describe hypochloruria (4, 16). Duval (16) noted a large urinary excretion of sodium bicarbonate (28 gm) on the third day of a burn. He

believed that this was due to the union of sodium with carbonic acid and the subsequent elimination as sodium bicarbonate, and thought that this explained the empiric fact that the administration of sodium bicarbonate in burns appears to be harmful. In Keeley, Gibson, and Pijoan's (33) experiments, the urine in one animal was studied for amount, specific gravity, and chloride content. The specific gravity reached a height of 1.090, and the last three specimens showed no chloride at all. The behavior of the specific gravity with regard to the urine excreted may be seen in the chart from McClure and Lam (45) (Fig 5).

Rabboni and Abbruzzo (50) studied the "Donaggio reaction" in the urine of burned patients. This reaction is said to be positive when the substance being tested inhibits the precipitation of thionin in the presence of a mordant, such as ammonium molybdate. The writers found the reaction to be positive in burns, and the intensity of the reaction paralleled the clinical course in the experimental animals. However, since the reaction is said to be positive in all febrile conditions, epilepsy, hemiplegia, herpes zoster, and cancer, it would appear to be too non-specific to be of practical value in the care of burns.

Lucido (38) noted a high urinary nitrogen excretion in a burn case, the values being 30 gm on the third day, 13 gm on the eleventh day, and 10 gm at a later date.

ANOXIA

Keeley, Gibson, and Pijoan (33) studied the oxygen saturation of arterial blood in 7 burned animals. Remarkably low values were obtained, although it should be noted that these animals were under heavy sodium-pentobarbital sedation. The amount of anoxia produced by the barbiturates alone has been observed by McClure, Hartman, Schnedorf, and Schelling (44). Further studies on the oxygen saturation in human burn cases should be carried out. Buis and Hartman (11) believe that the changes in the liver in burns may be largely anoxic in nature. Oxygen therapy has been used in the treatment of burns (57), but the indications are not well defined. The nature of the injury makes the administration of oxygen by the use of a tent technically difficult. There are two reports from England which state that beneficial results have been obtained in the treatment of "burn shock" with the B.L.B. oxygen mask (7, 58).

MISCELLANEOUS OBSERVATIONS

A low blood cholesterol was noted in Lucido's case (38). In animal experiments, de Vincentiis

(15) found a slight increase in the cholesterol. The blood diastase was normal in Lucido's case. Determinations of the blood Vitamin C will frequently show low values, and the implications for treatment are obvious.

COMMENT

It is difficult to summarize and evaluate the data presented in the above review. There seems to be no doubt that the contributions on the subject of hemocoagulation and its treatment by the replacement of plasma are important. Fluid administration has been put on a more rational basis. Replacement must be qualitative as well as quantitative. The problem of the toxin of burns remains unsolved. Recognition of liver damage explains some of the morbidity and mortality in burns. Whether this hepatic injury is due to a toxic substance or to the lack of something for example oxygen, is not known. Careful investigative work on this and other problems in burns is needed.

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SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Schultz, W. The Value of the Blood Picture in Surgery (Der Nutzen des Blutbildes in der Chirurgie) *Deutsche med Wchnschr*, 1940, 2: 581

The author demonstrates the value of the blood picture in surgery particularly on the basis of a severe septic case involving a female patient, who had become ill with an inflammation of the throat fourteen days before admission. During the last week, renewed attacks of high fever with chills made their appearance so that a sepsis of tonsillar origin was assumed, a diagnosis which was supported by the finding of the streptococcus hemolyticus. The tonsils had already undergone healing, but a descending sepsis originating in the tonsils was assumed, and for this reason it was proposed to undertake either unilateral or bilateral exposure of the jugular vein. However, before the proposed operation, another blood smear was taken, which showed a leucopenia of 3,400 with only 2 per cent neutrophilic leucocytes, 1 per cent eosinophils, and 97 per cent lymphocytes.

Since we know that an increase of the neutrophilic leucocytes of the blood, which is usually accompanied by a shift to the left of the neutrophils, is to be regarded as a defense reaction of the body, while, on the other hand, the existence of a severe neutrophilic defect represents a dangerous loss of resistance in the body against the invasion of bacterial infections, the nature of the situation was therefore clarified and the planned surgical procedure was omitted. In the face of this type of agranulocytosis, surgical procedures are contraindicated. In the instance described, it was not possible to clinically diagnose this agranulocytosis immediately. Inflammations of the oral cavity and tonsils are, among others, suspicious indications. The lack of resistance to surgical procedures of persons suffering with agranulocytosis is very impressive, and cases are known in which comparatively harmless operations have led to a recurrence of an agranulocytosis which had been withstood for a long time, and death followed.

There are, therefore, people in whom the unfavorable reaction of the bone marrow can be discerned beforehand through the existence of a leucopenia and relative lymphocytosis. This is true especially in individuals who have been exposed for a long time to occupational pathological injuries, such as lacquer workers, polishers, and people in the automobile business. As a result of the chronic absorption of benzol, toluol, and similar substances, the bone marrow undergoes injurious changes. Also, some people may undergo changes in the bone marrow, under certain circumstances, in the nature of an agranulocytosis, as a result of the influence of certain medications. Among the latter are salvarsan, and bis-

moth and gold preparations, especially to be noted, however, are pyramidon and substances which contain pyramidon, allonal, or veramon. The sulfanilamide preparations also belong to this group (prontosil, septacrine, albucid, and eubasin), these are preparations which are most likely to be used in septic conditions. Fatal issues have been observed after the use of as little as 30 or 40 gm of sulfanilamide and prontosil. For this reason one should give the larger doses only for a short time in cases of sepsis, and check up on the blood level at definite periods after doses of 20 gm have been given.

The treatment of an established agranulocytosis consists of immediate cessation of those medications which may be suspected of causing the bone-marrow injury. The effectiveness of medications which produce a leucocytosis in the normal individual is questionable, on the other hand, successful results from the use of blood transfusions have been observed. In those conditions in which the situation is questionable, a glimpse into the microscope will reveal the existence of a satisfactory sufficiency of neutrophilic leucocytes. In the same manner, one may obtain information concerning the condition and number of the blood platelets. Their presence in the circulating blood is necessary to the maintenance of the normal capillary blood coagulation time. If there is a dearth of blood platelets, the question of a hemorrhagic diathesis, a condition known as Werlhof's disease, will arise. Even normal individuals can, under certain circumstances, be forced into this condition by certain medication, viz., by taking sedormid, Quinine, ergotone, and phenacetine, are thought to work in a similar manner. The pathological increase in the number of platelets is an important factor in the development of thrombosis and also in the development of postoperative thrombosis. (BODE) HARRY A. SALZMANN, M.D.

Shay, H., Gershon-Cohen, J., Fels, S. S., and Munro, F. L. The Fate of Ingested Glucose Solutions of Various Concentrations at Different Levels of the Small Intestine. *Am J Digest Dis*, 1940, 7: 456

The experimental technique employed by the authors was essentially the same as that previously reported in studies on the absorption and dilution of glucose solutions in the human stomach and duodenum. Glucose meals of 5.4 per cent, 13.5 per cent, and 25 per cent concentrations were instilled into the stomach through a single lumen tube. With a special four lumen tube at different levels in the small intestine the behavior of such meals was studied in their course. Highly concentrated glucose meals were found to be undesirable because of irritation to the duodenal mucosa.

The rate of gastric emptying decreased as concentration of the meal above isotonicity increased.

because of the effect of hypertonic glucose solutions on the duodenum. In the duodenum low concentrations of glucose were readily absorbed while high concentrations were diluted. The dilution mechanism assures a stream of glucose to the upper jejunum that is at, or below isotonicity and under such conditions the small intestine beyond the duodenum acts only in an absorptive capacity. The greatest portion of the glucose of isotonic meals is absorbed by the duodenum and upper jejunum. After hypertonic glucose meals, the percentage of total glucose absorbed beyond the duodenum is unrelated to the concentration of the meal or to the total amount of glucose absorbed. The osmotic pressure of fasting intestinal contents was below isotonicity at all the levels studied. Water absorption appeared to be greatest from the lower small intestine.

Blood sugar curves resulting from the absorption of the glucose at various levels of the small intestine are discussed.

WALTER H. NADER, MD

Glus, J. A.: Paravertebral Procaine Block in the Treatment of Postoperative Atelectasis. *Surgery* 94, 8-9.

Previous authors have established the fact that atelectasis is the predominant postoperative pulmonary complication. Hypoventilation of the lungs and decreased efficiency of the cough mechanism appear to be the result of pain in the abdominal incision, which directly and reflexly interferes with abdominal and diaphragmatic excursion. Capelle has shown that continuous anesthesia of the abdominal wound will result in reactivation of the diaphragm and rise of the vital capacity from the usual 30 to 4 per cent of normal immediately after upper abdominal operation to 50 per cent. Morphine will produce an elevation of only 3 to 5 per cent.

The ability to cough effectively following an abdominal operation may be drastically influenced by a decreased amount of tidal air available for repleting out the pulmonary tree as well as by pain in the abdominal wound. Forceful movements of the abdominal muscles cause pain, and this results in weak restrained coughs which do not serve to remove secretions. When these secretions are retained, obstruction of the tracheobronchial tree occurs, and trapped air is rapidly absorbed, and atelectasis results. Unless the collapsed areas are reexpanded inflammatory changes follow and pneumonia is produced.

The usual methods for evacuating secretions are active hyperventilation either voluntarily or by means of carbon dioxide inhalations, frequent changes in position and postural drainage, vigorous percussion over the collapsed lobe, suction with thin retained secretions (ammonium chloride potassium iodide) and intratracheal suction or bronchoscopy.

Thirteen reports of cases of postoperative atelectasis following appendectomy in which paravertebral procaine block anesthesia of the wound was induced ventilation as augmented and cough became more

effective immediately following this procedure. Rapid disappearance of the signs and symptoms of collapse of the lung followed.

The findings suggest that paravertebral procaine block may be of aid in the treatment of postoperative atelectasis.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Farrer, C. J.: Vitamin C Analysis in Relation to Clinical Problems. *Overt. Bull. Northwestern Univ. Med. School*, 94, 14-20.

This is a detailed review by an authority in the field of Vitamin C metabolism. Vitamin C tolerance tests depend upon the probability that as the tissues become saturated larger amounts of the test dose will be excreted in the urine. The blood level also varies with the diet in normal young adults the values range from 0.1 to 2 mgm. of reduced ascorbic acid per 100 cc. of plasma. If the dietary intake is less than 15 mgm. per day the blood level will be less than 0.1 mgm. per cent. If over 100 mgm. per day the blood level will be over 1 mgm. per cent. In infants, scurvy may occur with blood levels as high as 0.4 mgm. per cent but in older individuals the fasting plasma level normally averaged only 0.5 mgm. per cent if the diet had contained an ordinary amount of fruit and vegetables. In adults scurvy usually does not occur until the blood level is much lower than that frequently found at the onset of scurvy in young children. Adult plasma values of about 1 mgm. per cent are not infrequently observed in individuals without marked symptoms of scurvy. Little or no correlation existed between the blood level and capillary fragility. Errors are observed in vitamin balance such as completeness of absorption from the intestines, and excretion in the urine and feces, must be considered.

The amount of Vitamin C normally occurring in the feces is extremely small, as shown by studies on patients with esophageal strictures. Bacterial destruction of the vitamin in intestinal loops as it died. The amount absorbed from the intestine increases with the amount administered. Phosphorylation is not necessary for the absorption from the intestine. Apparently the absorption can be explained on the basis of simple diffusion mechanism. There are approximately 5 mgm. per day in the stool of normal individuals taking dequate amounts of Vitamin C. Even with enormous dosage by mouth the fecal excretion decreased to only 1 mgm. per day. The urinary excretion does not increase in direct proportion to increased ingestion. High plasma levels of Vitamin C thought to maintain an optimum rate of production of intercellular substances associated with collagen formation, normal dentine and bone formation and the production of many other cement substances, including that of the vascular endothelium. Clinical and laboratory studies suggest that Vitamin C imparts tissue wound healing. Fecal excretion during

driether in infants is greatly increased. Vitamin C is said to be decreased in the blood of patients with arthritis. Studies on patients with induced hyperpexia show no significant difference between the level during the fever and the pre-treatment level.

In relation to detoxifying action, a definite relation of Vitamin C to heavy metals was studied. Iron causes a marked decrease in plasma ascorbic acid, associated with a rapid rise of hemoglobin. Arsenicals also lower plasma ascorbic acid and, as evidence of detoxification, patients previously sensitive to arsenicals have been permitted to resume treatment upon the administration of suitable doses of ascorbic acid, when the optimal plasma value was attained. A high intake of Vitamin C is indicated during heavy metal administration. PAGE STARR, M.D.

Hadfield, G., Swain, R. H. A., Ross, J. M., Drury-White, J. M., and Jordan, A. Blast from High Explosive. Preliminary Report on 10 Fatal Cases With a Note on the Identification and Estimation of Carboxyhemoglobin in Formal-Fixed Material. *Lancet*, 1940, 239: 478.

It is established beyond reasonable doubt that sudden death without gross trauma may result from the impact against the body of the violent, rapidly moving wave of high atmospheric pressure produced in the immediate neighborhood of an explosion. The authors carried out detailed post mortem examination on 10 civilians who had died suddenly or a few hours after short-range exposure to the detonation of high-explosive during aerial bombardment. In all cases circumstantial evidence pointed to death being due to "blast."

In the cases studied, necropsy findings showed that 5 of the individuals died from the effect of "blast" alone. In 3 of the cases the authors brought to light the interesting fact that in addition to lesions produced by "blast," there was such a high degree of saturation of the blood by carbon monoxide as to leave little doubt that carbon monoxide poisoning was the cause of death, this carbon-monoxide resulting from the combustion of explosives. The remaining 2 patients were found to have died from compression asphyxia rather than from the blast.

The chief and most uniform gross pathological findings in those cases in which death was due to "blast" were (1) the presence of frothy, blood stained fluid in the mouth, nose, trachea, and bronchi, (2) patchy areas of hemorrhage in both lungs, and (3) the absence of subpleural hemorrhages or hemorrhagic rib markings. No other gross pathological findings were noted consistently. Microscopically, the only significant and uniform findings were observed in the lungs. The lungs showed areas of capillary hemorrhages varying in size, and also acute overdistention of respiratory bronchioles, atria, and alveoli. Microscopic bullæ caused by the splitting of the visceral pleura because of the acute emphysema was noted in some cases.

With regard to those cases which terminated fatally because of carbon monoxide poisoning, the

most striking single difference from the "blast" cases consisted of the striking fresh pink color of the hypostasis. Spectroscopic examinations were not always immediately feasible in these cases, but it was found that blood expressed from the lung after formal-saline fixation gave satisfactory spectroscopic determinations both qualitatively and quantitatively. This point was determined experimentally.

In the 2 deaths resulting from compression asphyxiation from fallen debris, the striking features were the capillary and venous congestion and the edema which were found.

Since the amount of blood extravasated into the lung varied greatly and did not produce massive hemorrhages, the authors do not believe that this hemorrhage is the cause of death in "blast" cases. Rather, this lesion is only a trustworthy indication that an individual has been subjected to high pressure. The authors state, "It seems more likely that blast produces death by interfering with some vital tissue or centre in which, from the extreme rapidity of action, structural changes are unlikely to be found." LUTHER H. WOLFE, M.D.

Monod, R. Some Revisions of the Method of Treatment of Penetrating Wounds of the Chest (Quelques retouches aux directives admises du traitement des plaies pénétrantes de poitrine). *Presse méd.*, Par., 1940, 48: 737.

Some war wounds of the thorax are so severe that the patient dies at once or while being carried to the dressing station, while others are hardly as serious as wounds of the limbs. However, it is the wounds of moderate severity, those between these two types, that have led to so much dispute as to the methods of treatment.

In the last war the general policy was one of abstention from active surgical treatment because it was held that hemorrhage, no matter how threatening, tends to stop spontaneously, both from pressure by the blood and collapse of the lung from the pneumothorax. There was thought to be also less danger from infection than in wounds of the abdomen or limbs because the lung tissue has a certain capacity for killing bacteria. However, toward the latter part of the war a more active treatment was advocated, particularly by Pierre Duval.

The author believes that experience in this war has shown the value of this more active treatment. This method of procedure is justified by the fact that thoracotomy is not a serious operation, it is as simple as an exploratory laparotomy. There are some hemorrhages that do not stop spontaneously and which kill the patient if bleeding is not stopped in time. There are projectiles, particularly fragments of shattered bombs, which are not well tolerated and which cause infection if not removed. Thoracotomy is the only method of stopping hemorrhage, removing projectiles, and preventing infection.

Of course, not all patients are operated on even by the most ardent advocates of surgical intervention.

It is extremely important to be able to make wise selection of the patients to be operated on. The decision will be based on the nature of the projectile, the roentgen findings, and the presence or absence of fractures. However, operation is performed more frequently than it formerly was because the patient with a wound of the thorax can not be transported without danger. Therefore, unless it is contraindicated, the patient should be operated on and not transported for at least a week. At the end of that time he should be taken back to base hospital where there are specialists in surgery of the thorax and which is not too far from the front. A patient with a wound of the thorax should never be dismissed from treatment until he is completely cured. Too early dismissal is the cause of many of the cases of chronic empyema and tuberculous fistulas of the pleura which are so hard to cure and that is why it is so important to place these patients in the hands of a specialist rather than to send them to a general hospital.

ANDREW G. MORO, M.D.

Eloesser L. The Treatment of Compound Fractures in War; Reports of Practical Experience in the Spanish Civil War. *J Am Med Ass*, 1938, 5, 848.

Th these reports on his experience with treatment of compound fractures in the Spanish Civil War. Many practical points are discussed with a view to simplification and the elimination of large apparatus or supplies which are difficult or impossible to obtain in mobile surgical unit.

Preparation of the skin is accomplished with chlorinated lime, and this may be followed by an alcoholic antiseptic solution. The skin is shaved—including all the area to be covered by plaster.

Anesthesia by local infiltration, block or analgesia is recommended since neither anesthetics nor after care may be available for a 6-minute anesthetics ethyl chloride is recommended for inhalation. One hundred mgm. of procaine in 3 ccm. of cerebrospinal fluid are recommended for fractures of the lower extremity. Evipal is to be avoided in head injuries.

X-ray treatment for the first cure of these injuries is believed to be unnecessary and time-consuming.

The position on the table is thought out with a view to assisting the care of the wound and later application of the cast.

The wounds are thorough debrided and all gross foreign bodies removed. An attempt is made to save the deeper tissues rather than the skin. Wound should not be wiped dehydrated and contaminated muscle should be excised. Nerve ends are freed and brought together with single fine black silk sutures. Tendons should be left if they can be cleaned and covered with soft tissue about tension. A single suture may be used to close them if it seems likely that they can be covered. If it is not possible to close them the ends are left to retract into their sheaths to prevent loughing joint re-treated similarly. Bones may be reduced if necessary but

plates reduced only if the wound is left widely open covering the bone with soft part without tension may prevent sequestration. Sulfanilamide is used in the wound. Wounds should be closed only about the hand or ankle when no tension is present and in practically no other case. The wound is packed and plaster splint is applied.

THOMAS C. DOUGLAS, M.D.

Bailey E. C. B. The Treatment Complications, and Last Result of Acute Hematogenous Osteomyelitis. *Brit J Surg*, 1938, 25, 10.

Th the author has studied 300 cases of acute hematogenous osteomyelitis, 85 per cent of which occurred in patients nineteen years of age or younger. The mortality followed the curve of incidence except in the cases of infant in which it is much higher. Eighty-eight per cent of the cases of osteomyelitis and 9 per cent of the deaths are caused by staphylococci. The incidence of primary focus in 49 cases carefully studied from this standpoint is, or nearly 5 per cent. The prognostic value of quantitative blood cultures is emphasized. Ninety-seven per cent of 9 cases showed pyemia. Most most in examination. The mortality is about the same.

Whether drainage of periosteal spaces, incision of periosteum with drilling of the bone, or drainage of the medullary cavity as done. Secondary operations were accompanied by lower mortality.

The complications are chiefly suppurative thrombosis. Others were pathological dislocation, pathological fracture and peripheral nerve injury. Fifty-nine per cent of the pathologic are traced in the follow-up and 87 per cent are found to be cured. The best results in the cases of arthritis followed splint.

The treatment of the local infection attacks on the toxaemia, the bacteremia and the local lesion. The first is treated by intravenous injection of anti-staphylococcal serum. The thorax has been debrided by the use of hemithorax in combating the bacteremia and citric cases. In which the primary focus as examined with good results, but this hardly seems to be sufficient evidence to encourage one to adopt this method.

Immobilization and reduction of the bone are the basis for treatment of the local lesion.

THOMAS C. DOUGLAS, M.D.

Haberer H. Vascular Surgery under War Conditions. *Zeitschr. Gefasschirurgie im Krieg*. *München und Berlin*, 1938, 249.

Definitive treatment of all the blood and in view in caring for the war cases of scalp injury and only under special circumstances should this be preceded by temporary control of the bleeding by means of pressure dressings or tourniquet. Of particular danger are the severing, grazing and perforating gunshot wounds of the principal arteries because of the deceptive, often life-threatening, secondary bleeding. This may occur even when there is early cessation of the hemorrhage when one might

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be tempted to regard the injury lightly. Noteworthy is the pulsating hematoma which is the precursor of a false aneurysm. The aneurysm itself should not be operated upon before the twelfth day, in the third or fourth week the best results will be obtained. Where feasible, therefore, the development of such an aneurysm should be favored.

For the medical officer accompanying the foremost units the following proposals may be advanced which there is no prospect of preservation or functional restoration of the extremity. Ligation in the wound itself or at the location of choice should be done in those cases in which the prospects are more favorable. Pressure dressings or tourniquets are to be used when the hemorrhage is not dangerous and the conditions of transport are favorable. Finally, the wound should not be disturbed when an initial hemorrhage has ceased.

In the patients with traumatic or false aneurysm, with arterial aneurysm, and with the various forms of arteriovenous aneurysm the diagnosis is easy, as a rule. The important thing, after consideration of the direction taken by the missile and the location of the vessels, is to keep these factors in mind.

The treatment by ligation justified today, at most, is the form in which the aneurysmal sac is slit open and the vessel lumen inside of the sac is closed by ligature. The ideal method is circular or lateral vascular suture. In this last method the suture line is placed in the direction of the axis of the artery, because of the danger of stenosis. In the suturing of the vessel, the aneurysmal sac need not be extricated, because when it is removed from the effects of the circulation it undergoes obliteration. Accompanying injuries to the veins are ligated with impunity. It is understood, of course, that vascular suture is to be reserved for arteries, ligation of which would be accompanied by danger. To this group belong the common and internal carotid arteries, the subclavian, axillary, cubital, and iliac arteries, and the femoral artery above its junction with the profunda.

The author observed in the World War 251 cases of aneurysm which were operated upon. The operations included 182 vascular sutures, with 237 recoveries. (DRUEGG) JOHN W. BRENNAN, M.D.

Hall, W. W. Tetanus Toxoid Immunization in the United States Navy. *Ann Int Med*, 1940, 14 565

The work on tetanus immunization in the United States Navy since 1934, some of which has been previously reported, is summarized. It is concluded that active immunization by means of plain or alum-precipitated toxoid, reactions are minor and infrequent. It is pointed out that toxoid immunization has been adopted by the British, French, and Italian Armies. No case of tetanus in individuals immunized with toxoid has yet been reported. The present plan in the Navy calls for 2 injections eight weeks apart as basic immunization, injection at the

time of injury if deemed necessary, injection at four-year intervals to maintain immunity at a high level. All midshipmen at the Naval Academy are now continuously immunized with alum-precipitated tetanus toxoid. More than 3,400 have been so protected, as well as many other Navy personnel and dependents. Toxoid immunization is ideal for military services and all other groups which can be medically well controlled. WALTER H. NADLER, M.D.

Maclean, I. H., and Holt, L. B. Combined Immunization with Tetanus Toxoid and T A B Response to Tetanus Toxoid and to T A B Vaccine—Reactions Following T A B T. *Lancet* 1940, 239 581

The authors have confirmed Ramon's contention that when tetanus toxoid is administered in combination with typhoid-paratyphoid (T A B) vaccine the antitoxic response is much greater than when the toxoid is given alone. Their figures show that it is five times as great, and that after two doses of the combined antigens (T A B T) given four weeks apart, every subject tested had over 1 unit per cubic centimeter of tetanus antitoxin in his serum. They show, also, that with injections separated by an interval of four weeks the immunity response to the antigens of T A B vaccine are as good as with the usual interval of from seven to ten days.

The procedure of combined immunization will vary according to the circumstances. If there is imminent danger of enteric fever, then the first inoculation should be of the combined vaccine (T A B T), but in order to obtain immunity rapidly to the enteric fevers a second dose of T A B should be given after from seven to ten days. The second dose could be of T A B T since the reaction is not greater than with T A B alone. It would be necessary to give a third dose of tetanus toxoid one month later to ensure sufficient protection against tetanus. If there were no imminent danger of typhoid or paratyphoid, then the method of choice would be 2 inoculations of T A B T with an interval of a month. This would mean that six weeks after the first dose the individual would have a good immunity to both diseases, and would need only 2 inoculations. When the tetanus toxoid is combined with T A B vaccine, an interval of not more than four weeks is necessary to get full immunity. More than 500 persons were receiving T A B T and the reactions were no greater than those from T A B vaccine alone. JOHN S. LOCKWOOD, M.D.

Langemeyer, C., and Gottesbueren, H. The Treatment of Tetanus and the Prevention of Complications from the Use of Serum both in Prophylaxis and in Active Therapy (Die Behandlung des Wundstarrkrampfes und die Vermeidung der Gefahren der Serum Anwendung bei der Prophylaxe und der Therapie). *Chirurg*, 1940, 12 422

Serum treatment becomes less dangerous with the use of purified protein poor, 2,000-fold concentrated

horse serum with protein content of 5 per cent or of the 1,000-fold concentrated cattle serum. A complete separation between albumin and serum protein has as yet not been obtained, but the highly concentrated purified sera contain only pseudoglobulin. The phenol content of the sera is harmless. Serum sickness on the whole is overestimated. The fear of serum reactions has led many physicians to do away completely with the employment of sera for prophylaxis. Boehler and others believed that they were able to reach the desired goal by desferment alone. The latter, however, is often practically impossible. The statistics of C. Franz, which showed that since the introduction of passive immunization in the World War the number of tetanus cases has diminished from 0.35 to 0.04 per cent, speak for the blessings of prophylaxis. Serum shock is almost always preventable. It is necessary to determine by eliciting a history whether and when serum injection had been given previously and further whether the particular patient or his family suffer with any form of allergy (horse asthma, tendency to urticaria, angioneurotic edema, or asthma). Allergy may also be acquired, but we know that this type is usually of a temporary nature. As far as tetanus serum is concerned, we know that ten or twelve days must elapse before sensitization to foreign protein sets in. In this latent period the others have repeatedly given large doses of serum intravenously for week without encountering any form of serum sickness. After this period, hypersensitivity begins to assert itself but usually however this tends to diminish after three or four weeks. Up until the sixth month immediate reactions may still occur but later the reactions if present tend to be more delayed. After the course of years the hypersensitivity almost always disappears completely.

Serum shock during the period of hypersensitivity occurred only during the course of intravenous injections. The rarity of this condition during the course of the first injection for prophylaxis can be realized by the fact that Bruce saw it occur only times in the course of 2,000,000 injections. On the other hand, he found fatal cases which occurred during the course of administration of only 493 therapeutic doses however during a time it is frequently impossible to obtain proper history. Koojetanz in whose clinic both tetanus and gangrene serum are continuously injected, never saw a case of serum shock.

The others undertook animal experiments and were able to ascertain that in guinea pigs and rabbits repeated injections given subcutaneously only very rarely produce serum shock. During the last one and one half years, 7 cases of tetanus were seen at the Hamburger Clinic. At this clinic the wound of entrance is excised as radically as possible and is left open. Salves are not used because of the danger of obstruction. Hydrogen-peroxide drip is used but none of this substance is injected into the wound. High doses of concentrated 2,000-fold protein poor serum is given intravenously and intramus-

cularly at the same time. The intramuscular injection has been completely abandoned since Schaefer has shown that the antitoxin passes out of the spinal so into the blood within few minutes after the injection is given and disappears completely from the sac within thirty minutes. The assumption that the blood vessels of the brain do not permit the passage of foreign protein and the antitoxin combined with the latter has not been proved. The assumption certainly does not apply to homogeneous blood (blood from similar species) because at this clinic blood from very actively immunized donor was used for transfusion and was able to cure a patient suffering from tetanus; however, in this case in addition to the immunotransfusion, large doses of serum were also employed. The massive doses of serum injured neither the heart nor the kidneys (electrocardiogram). The assumption of Lohrband, that previous injection with local anesthesia containing adrenalin around the site of the serum injection will prevent serum shock, cannot be proved, as animals never develop serum shock from intramuscular injection alone. Aside from the above treatment, this clinic also administered vertin, mostly however during the night, in order to permit ingestion of nourishment and better ventilation of the lungs during the in-between period. In 3 cases respiratory muscle spasm developed which, however could be overcome by the immediate injection of ergivan. Mitgal proved of great value in the treatment of the troublesome serum urticaria in this clinic.

(F. W. HARRIS, M.D.)

Rammelskamp, C. H. and Kaefler, C. S. Sulfathiazole Therapy of Staphylococcus Aureus Bacteremia. (*New England J. Med.* 940, 3 877)

They report their experience in treating 7 cases of staphylococcus aureus bacteremia with sulfathiazole. In each case careful studies were made of the effect of the drug on blood culture, white-cell count, and temperature and frequent determinations were made of the concentrations of sulfathiazole in the blood.

Of considerable interest is the special investigation which they made of the influence of sulfathiazole on the staphylococidal capacity of the whole blood of normal individuals and of patients suffering from staphylococcus infection. It was observed, in most of the experiments with normal blood, that if the original inoculum contained 1,000,000 organisms per cubic centimeter or less, complete sterilization of the blood occurred within forty-eight hours. The concentrations of sulfathiazole necessary for this effect varied between and 6.7 mgm per cent. In 3 experiments with the blood of patients suffering from staphylococcus aureus bacteremia, marked increase in the bactericidal capacity of the blood was exhibited following the administration of sulfathiazole. Sulfathiazole was much more effective in this respect than sulfanilamide.

In the three series of 7 cases there are 3 recoveries and 4 deaths. The recoveries occurred in pa-

tients who developed abscesses which it was possible to drain surgically. The authors believe that the accessibility of metastatic abscesses to surgical drainage is more important in conditioning the successful outcome of sulfathiazole treatment than the age of the patient, and they believe that surgical drainage of localized staphylococcal abscesses is essential to recovery in most cases. Since sulfathiazole usually sterilizes or greatly reduces the number of organisms in the circulating blood, the drug should be of particular value in preventing the formation of metastatic abscesses when administered during the acute septicemic phase of the disease. In most cases it is necessary to continue the administration of the drug for a period of several weeks.

JOHN S. LOCKWOOD, M.D.

ANESTHESIA

Halton, J. Anesthesia in Chest Injuries. Physiology, Anesthetic Methods, Intratracheal Insufflation, Choice of Anesthetic Agent, Administration, Conduction of Anesthesia, and Oxygen Therapy. *Lancet*, 1940, 239-675.

The author discusses the physiology of respiration in open pneumothorax.

Patients with chest injuries requiring immediate surgery are suffering from a lack of oxygen in the tissues, the anoxia of shock. If the chest is opened their respiratory exchange is further embarrassed by the physiological derangements produced by an open pneumothorax. This further increases the anoxia.

The author finds that the closed circuit method of anesthesia is mechanically and physiologically inadequate to combat anoxemia. In his opinion satisfactory anesthesia and efficient ventilation of the lung can be maintained only by intratracheal insufflation; the volume of air, gas, or air borne anesthetic vapor blown into the lungs must be between 15 and 25 liters per minute, and the flow must maintain a pressure in the lungs of from 5 to 8 mm. of mercury and should never exceed 12 mm. of mercury. The diameter of the catheter must not exceed one half of the diameter of the trachea.

Nitrous oxide or cyclopropane is ideal but too expensive. The author uses ether, but occasionally will use chloroform when there is extensive bronchial irritation or inflammation, or when diathermy is to be employed.

The apparatus must consist essentially of the following parts: a pump capable of delivering a steady current of air up to 30 liters per minute, an adjustable vaporizing bottle, an adjustable blow off valve and a manometer, a set of Magill's nasal intratracheal tubes, and a set of gum elastic intratracheal catheters with suitable unions for attachment to the delivery tube of the apparatus.

The author advises against the preoperative use of opiates and barbiturates. He induces anesthesia rapidly with vinesthene or ethyl chloride, then switches to open ether or chloroform until the laryn-

geal reflex has disappeared. He rapidly introduces a Magill tube through the nose into the trachea by the blind technique.

The catheter is then attached to the delivery apparatus which should deliver 15 liters of air mixed with anesthetic vapor per minute. The cyanosis rapidly disappears and the adjustments can be made to maintain satisfactory anesthesia. Only rarely is it necessary to introduce the intratracheal catheter with the aid of a direct laryngoscope. The author thinks it is dangerous to push the anesthesia that deep and in such cases would do a tracheotomy and insert the catheter through the tracheotomy opening.

All of these patients should be placed in an oxygen tent or given oxygen through the B. L. B. Mask immediately after operation.

JULIAN A. MOORE, M.D.

Pitkin, G. P. A Non-Oxidizing Epinephrine to Prolong Spinal Anesthesia with a Subarachnoid Capacity Control. *Anes. & Anal.*, 1940, 19-247, 315.

There are two objectional features to spinal anesthesia which have not been overcome as have the many other objections in the past. They are insufficient duration for the completion of the operation, and the drop in the blood pressure. However, re-examination of the theories advanced to account for the drop in blood pressure have disclosed that a misinterpretation of some of the observed phenomena have prevented the progress necessary to overcome these objections.

In local and block anesthesia the use of a vasoconstrictor such as epinephrine or ephedrine helps to prolong the anesthetic effect. However, epinephrine injected intravenously or intraspinaly has a temporary effect most likely due to oxidation. It has been found experimentally that epinephrine could be so treated that it would not oxidize in the spinal fluid of animals for several hours. This prolongs the anesthetic effect and at the same time helps to maintain the pressor effect of the vasoconstrictor. The fall in blood pressure with spinal anesthesia is not due to the effects of the anesthetic on the white ram, the vasoconstrictors, the sympathetic ganglia, or the postganglionic fibers as heretofore believed. Many experiments show that the stabilized blood pressure in spinal anesthesia is dependent primarily on a normal function of the suprarenal glands and the stabilizing secretion of the paraganglia. A new solution which the author has used to maintain the pressor effect and prolong the anesthetic effect has the following composition: each 6 c. cm. ampoule of the solution contains suprarenin 36 mgm., ephedrine hydrochloride 50 mgm., gladin acetate 10 mgm., novocaine 300 mgm., alcohol 7 c. cm., and distilled water q. s. 6 c. cm. This produces a solution much lighter than spinal fluid with a specific gravity of 983.

The heavy solution is prepared by displacing some of the water with a sufficient amount of glucose to give the solution a specific gravity of 1.025. The

glutidin citrate is a viscous tenacious substance having glue-like properties. It is readily soluble in weak alcoholic dilutions, and forms a water-soluble solution. On contact with the spinal fluid it precipitates, forming a semi-permeable osmotic membrane between the spinal anesthetic solution and the spinal fluid. This membrane permits the liberation of the suprarenin and the anesthetic by osmosis. The porosity of the osmotic membrane is such that it tends to synchronize the liberation of the suprarenin-ephedrine and anesthetic drug, and render the liberation of one entirely dependent upon the other.

This solution may be used as a solvent for any local anesthetic—novocaine, neocaine, pontocaine, nupercaine, or metycaine. Its vasoconstrictor properties not only stabilize the blood pressure but intensify and prolong the anesthesia. Three hundred mgm. of novocaine or neocaine will give upper abdominal anesthesia from two to two and one-half hours; 500 mgm. will produce lower abdominal anesthesia for three hours; 600 mgm. confined in the sacral segments of the dura will prolong perineal anesthesia for more than three hours; 700 mgm. of pontocaine will produce upper abdominal anesthesia from two and one-half to three hours, and to er-

belominal anesthesia from four to five hours; 7 mgm. of pontocaine pocketed in the lower end of the canal will give perineal anesthesia in excess of five hours.

The preparation of the new spinal anesthetic solution is the result of experiments conducted to prolong the duration of novocaine as used in spinal anesthesia. Suprarenin was used primarily for its vasoconstrictor properties. It was observed that not only was the duration of anesthesia extended because of the localized vasoconstrictor action, but also thepressor effect was prolonged so that the blood pressure could be maintained for several hours even when the nerves to the suprarenal glands had been anesthetized.

The usual precautions as to position of the patient with the heavy or light solutions must be observed. The patient remains in good condition during and after operation. The pulse is full and blood pressure is sustained, and sedation is induced by morphine and scopolamine prolonged with scopolamine. With the new solution hypotension is not a contraindication to the use of spinal anesthesia. Spinal anesthesia requires for its greatest usefulness a well-qualified professional anesthetist. If the objection to this form of anesthesia are to be reduced to a minimum.

M. C. L. LACROIX, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Davenport, C. B., and Renfro, O. Adolescent Development of the Sella Turcica and the Frontal Sinus, Based on Consecutive Roentgenograms *Am J Roentgenol*, 1940, 44 665

This study was undertaken to ascertain the changes that occur in the sella in the same child in successive years and to tie them up, if possible, with growth changes of the individual. Previous investigations made by others for similar purposes are reviewed briefly. In this study, roentgenograms of the heads of 46 boys and 50 girls between the ages of ten and eighteen years were made annually for five years, and comparative measurements served as the basis for the conclusions drawn. The technique used in making the exposures and computing the sizes is described in detail, and the results are tabulated. The conclusions reached are summarized as follows:

The area of the sagittal section of the sella turcica varies between the ages of ten and eighteen years, usually increasing with age, but in some individuals apparently decreasing, at least for a time. It varies with sex. Thus in children of fifteen years, the mean for 23 boys was 81.09 ± 4.02 sq mm, and for 34 girls it was 92.04 ± 4.07 sq mm. It makes about the same annual increase in both sexes between the ages of twelve and eighteen years, which indicates that the sex difference is established early. There is probably a real, though slight, correlation between the area of the sella and body weight, but the amount of increase in sella area in any period and the increase of weight in that period are not significantly correlated though sella area in relation to brain case area is fairly strongly correlated with body weight at the same time.

Roentgenograms used in the study of the sella also served to determine changes that occurred in the cranium during adolescence, especially in the development of the frontal sinus. The method employed for making comparisons in successive years is described and illustrated. Comments relative to pneumatization are included and the significance of the frontal sinus is discussed. The authors' findings are presented in the following summary:

A series of roentgenograms taken at different ages on the same individuals shows that the frontal sinus begins by a destruction of the spongy layer of the frontal bone above the ethmoid. Into the space thus formed the nasal epithelium outpockets. The sinus thus initiated enlarges as the osteoclastic process continues. At the same time the frontal bone in this region thickens and the outbulging may affect chiefly the inner face, or the outer face, or both faces of the frontal bone. The degree of development of the sinus is varied at adolescence from 0 to 700 sq mm in cross section at the glabella. The devel-

opment of the frontal sinus is a special case of pneumatization. It is probably a rudimentary process, as it is relatively unimportant for man in whom the skull is balanced on the vertebral column.

ADOLPH HARTUNG, M.D.

Pfeiffer, R. L. Localization of Intra-Ocular Foreign Bodies with the Contact Lens *Am J Roentgenol*, 1940, 44 558

Inasmuch as the Sweet method for localization of intra-ocular foreign bodies which has been in general use is not adaptable to improved or shock-proof roentgenographic equipment, some other method which can meet the requirements satisfactorily seems indicated.

For the past seven years the author has used an entirely adequate and satisfactory technique which employs a minimum of apparatus and which is easy as well as accurate. It gives a meridional localization, which is the easiest of all for the surgeon to interpret in the operating room. It utilizes a specially constructed Comberg contact lens in which the limbus of the cornea is designated by lead markers. Films made with it in the postero-anterior and lateral directions present images which lend themselves to plotting of the foreign body accurately in two planes. Detailed descriptions and illustrations of the procedure and apparatus used are included. Sources of error and means for their correction are also given consideration.

The use of stereoscopic films before localization is undertaken has the advantage of showing the presence of a foreign body. Bone free films taken after the manner of Vogt are also advised as they may reveal foreign bodies in the anterior segment of the eyeball or which are not visible on films made in the usual manner.

In the cases presenting foreign bodies located deeply, in which there may be doubt as to whether they are in the eyeball or orbit, injection of a small amount of air in Tenon's capsule permits visualization of the posterior segment of the globe and suitable exposures will lead to the differentiation.

ADOLPH HARTUNG, M.D.



Fig. 1. The contact lens especially adapted with four radiopaque markers for roentgenographic localization of intra-ocular foreign bodies.

RADIUM

Mahler, G. E. The Treatment of Cancer of the Lip and Mouth. *Radiology* 940, 35 59%.

The greatest hope of preventing cancer of the lip and mouth lies in the thorough and skillful treatment of the lesions which precede cancer. A erosion, fissure, papilloma, leucoplakia, induration, ulceration, or lump can be recognized and diagnosed almost from the day of onset. By making effort to treat such lesions, many early cancers will also be reached and cured.

Treatment of precancerous lesions. Erosions or fissures will likely disappear after removal of their causes or after one or two applications of silver nitrate. If after two weeks the lesion fails to heal one may resort to local destruction by electrodesiccation. The latter is used also for the treatment of the papillomas. Leucoplakia demands the complete and permanent cessation of the use of all forms of tobacco, the removal of foci of irritation from the teeth, or energetic anti-fetid therapy if syphilis is the causing agent. In progressive cases, electrodesiccation followed by erythema dose of unfiltered or lightly filtered radium plaques is indicated. Induration, ulceration, or lumps may easily be due to cancer and therefore they are treated with this view in mind.

Early cancer of the lip. The author prefers electro-surgical desiccation to destruction by irradiation in all early cases of cancer of the lip. The larger and more advanced cancers can also be treated by electrosurgery and if necessary the defect can be closed by plastic operation after the cancer is cured. However, better cosmetic result is obtained from treatment by radium molds or radium needling. A statistical compilation of 300 cases shows that five-year cures were obtained in 98 per cent of those lesions up to 3 cm. in diameter in 68 per cent of the larger ones and in 45 per cent of those with palpable lymph nodes.

Cancer of the mouth. This is more serious lesion because metastasis is likely to occur early and it may be extensive. The best method of treatment is by irradiation, but the technique of application depends on the size, location, and extent of the lesion and the grade of its malignancy. The author prefers to administer in all cases preliminary dose from 200 to 300 roentgens, to take biopsy and then to adapt the further technique to the pathological findings in the individual case. Generally the preliminary irradiation is carried out with high voltage roentgen rays or their equivalent with radium packs over the cheek and neck. The post biopsy irradiation is manifold. In certain instances, radium needles are applied interstitially in others radium tubes are used in the form of molds or surface applicators. Again in others further external irradiation is undertaken.

The author reports that in a group of 475 cases of cancer of the mouth five year survival rate of 50 per cent was obtained. Figures for the various locations are as follows: tongue, 7 per cent; buccal, 35 per cent; tonsil, 7 per cent; lower jaw, 50 per cent; palate and pharynx 58 per cent; and floor of the mouth, 50 per cent.

Metastases from cancer of the lip and mouth. Prophylactic irradiation with roentgen rays over the mental, submental, and submaxillary regions is carried out in all early cases. In the advanced lesions with manifest lymphatic involvement, block dissection of both sides of the neck may be performed although the author prefers here too the application of continuous radium packs over a period of about twenty five days, or the use of protracted, fractionated high-voltage (200 or 400 kv) roentgen therapy associated with transcutaneous radium puncture of the larger nodes. The technical procedure is described in detail.

All in all, irradiation is the preferable treatment for cancer of the lip and mouth.

T. LECUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Spies, T. D., Swain, A. P., and Grant, J. M. Clinically Associated Deficiency Diseases *Am J M Sc*, 1940, 200: 536

In a series of 1,250 consecutive malnourished persons in Ohio and Alabama, the diagnosis, predisposing cause, development, and specific therapy of nutritional diseases were studied. A diagnosis of pellagra was made only if characteristic mucous-membrane or dermal lesions, or both, were present, a diagnosis of riboflavin deficiency depended upon the presence of characteristic angular lesions of the mouth or ocular symptoms, a diagnosis of beriberi was made only in the presence of nutritional neuritis.

The diets of these patients were found deficient in the following manner: (1) calories—the average person received only 50 per cent of his estimated energy requirement, (2) protein—35 per cent deficient, (3) minerals—nearly all received substandard amounts of calcium, phosphorus and iron, (4) vitamins—the average fell below the suggested standards for normal persons as follows: Vitamin A, 67 per cent, Vitamin B, 72 per cent, Vitamin C, 47 per cent, riboflavin 73 per cent.

Clinical response to specific vitamins was striking, best general clinical results were obtained when all specific substances were supplied and supplemented with yeast powder or liver extract. There were no fatalities due to these deficiencies in the treated cases and approximately 30 per cent of the patients were able to obtain positions to work steadily, whereas previously they had had ill health for years which interfered with their ability to work.

PAUL STARR, M.D.

Minot, A. S., and Bialock, A. Plasma Loss in Severe Dehydration, Shock, and Other Conditions as Affected by Therapy *Ann Surg*, 1940, 112: 557

The authors define shock as peripheral circulatory failure due to a discrepancy in the size of the vascular bed and the volume of intravascular fluid. Failure of the peripheral circulation due to a reduction in the volume of the circulating blood is known as secondary or hematogenic shock. This condition may be a result of severe dehydration, extensive hemorrhage, nutritional edema, or loss of blood plasma into the tissue spaces due to increased capillary permeability from mechanical, chemical, or thermal trauma, or from anoxemia.

It is essential in the treatment of impending hematogenic shock to restore and maintain an adequate volume of intravascular fluid. The nature and amount of the fluid employed for this purpose must be adapted to the physiological requirements and the pathological handicaps of the individual

patient. If there is no capillary injury the problem is relatively simple, but in the presence of increased capillary permeability the loss of plasma protein into the tissue spaces makes the problem more difficult.

If both water and electrolytes have been lost from the blood stream, both must be replaced. Water can be retained in the body only when it contains enough salt to make an isotonic solution. Glucose solutions alone cannot overcome dehydration when salts have been lost. If there has been a large loss of chloride ions, as in persistent vomiting, sodium chloride must be supplied. If sodium ions have been depleted sodium bicarbonate or sodium lactate should be given.

The method by which fluids are administered should also receive individual consideration. In many patients there are obvious handicaps to the administration of fluids by the gastro-intestinal or subcutaneous routes. The intravascular volume can be increased most effectively by supplying fluids intravenously. However, in patients with increased capillary permeability this method provides only a temporary increase. In a short time the plasma colloids become more dilute, tissue edema develops or increases, and the blood stream remains dehydrated. Under these circumstances sufficient colloid must be administered to retain fluid in the blood stream.

At present there is no specific way to reduce the permeability of injured capillaries. Colloid must be added to the blood stream fast enough to replace that which is lost, and to maintain an effective circulating volume. This can be accomplished most satisfactorily by transfusions of blood plasma.

EDWARD W. GIBBS, M.D.

Sadusk, J. F., Jr., Waters, L., and Wilson, D. Anuria Due to Sulfonylpyridine Calculi *J Am U*, 1940, 115: 1968

Two cases of complete anuria occurring during sulfonylpyridine therapy are reported. The anuria was due to blocking of the ureterovesical orifices by calculi. In both instances treatment by means of cystoscopy was successful. One of the patients died of a neurosurgical complication. The pathological changes in the upper urinary tract consisted essentially of marked tubular and capsular dilatation, congestion and vacuolization within the glomerular tufts, and an acute hemorrhagic pyelo-ureteritis extending into the adjacent renal medullary tissue.

WALTER H. NADLER, M.D.

Sköld, N. Relapsing Febrile Non-Suppurative Panniculitis *Acta med Scand*, 1940, 105: 43

The case of a fifty-one-year-old woman who had an active infection over a period of about four years is reported. This infection was revealed by a slight

Increase of temperature with afternoon values up to 37.7°C . (once 38.3°C .) and an increased sedimentation rate. There were no electrocardiographic changes which pointed to endomyocarditis. In addition, changes of definitely inflammatory nature were observed in the panniculus adiposus. These eruptions were bright red, painful spots on the skin, about 6 cm. in circumference and below each one subcutaneous nodule the size of walnut could be felt. After they had been present a few days the redness would disappear and leave scars which looked like bruises. At that stage the nodules would no longer be spontaneously painful, but they were extremely tender when pressed. Two to three weeks later the lesions would pale completely but the tenderness and pressure would remain for several weeks more. There were usually one or two nodules of this kind at different stages of development on the extremities, and hardly could one pale, than another would appear. Whenever these changes extended to the surface of the skin, there were redness, tenderness, and infiltration, which gradually regressed and left scars. There was never any suppuration.

Biopsy of deeply imbedded subcutaneous nodule was made. The tissue consisted of fat tissue divided into lobes by narrow strands of connective tissue. Scattered lipoblasts were found, and the whole formation had the same structure as lipoma.

The nature of the infection could not be established. It was thought that perhaps paratuberculous infection of the teeth from which the patient suffered might have been of some significance since greater dissemination of the lesions was observed at the same time that the infection became acute.

Various kinds of treatment were attempted during the patient's three hospital admissions. Despite these and the extraction of 4 diseased teeth, the disease showed itself to be strongly resistant to treatment rather the condition became worse.

SURGEON H. KLEIN, M.D.

Adams, R., Jones, G. and Marble, H. C. T. ber culous Tenosynovitis. *New England J. Med.* 1940 3:700

Thirty six cases of tuberculous tenosynovitis have been treated at Massachusetts General Hospital during the past forty-five years. An analysis of the cases showed the average age of the patients to be thirty six years; there are males and 5 females. The right hand is involved in 17 cases, the volar surface is involved 5 times, the dorsal surface 3 times. The influence of occupation is inconclusive but hardness of the hand may be a predisposing factor. The importance of history of trauma is difficult to determine. There is no evidence of direct inoculation of the infection in this group. Thirteen of the patients had tuberculosis elsewhere in the body; however, the fact that the disease is frequently present without pulmonary infection is certain.

Early diagnosis may be difficult; later there is gradually developing mass on the volar aspect of

the hand with inability to completely flex or extend the fingers. Paresthesia from pressure on the median nerve may occur. One of the most valuable aids in making a diagnosis is the keeping of a daily four-hour temperature chart and a daily rise to 99.6° or 100.6°F is suggestive. Finger motion may cease grating or creaking because of the accumulation of degenerated fibrinous deposits within the tendon sheath—so-called rice bodies. These and two-way fluctuation beneath the annular ligament mean a burned-out lesion. Suspected cases should be splinted from the beginning.

The pathological diagnosis was proved in 7 cases and established clinically in 9. Operation as performed in 33 cases, incision and drainage of fluctuant masses in 9, and resection of the involved tendon sheaths in 4. Follow-up of 6 of the drained cases revealed 4 failures and 2 failures among 7 patients treated by resection of the sheath. Two of the 3 patients but were not operated on recovered completely.

These results are none too good. It is striking that tuberculous disease often considered a contraindication to necessary surgical procedures, should have been so avidly attacked when manifested in the tendon sheaths. Tuberculosis is a generalized disease and any focus is likely to be paralleled by similar infection elsewhere in the body. Tuberculosis of the tendon sheaths should receive the same systemic treatment accorded to tuberculosis of the lungs or spine. Surgical attack on a tuberculous focus such as tendon sheath without knowledge of whether the lesion is progressing or regressing may result in failure. Such knowledge can be gained only by periodic observation, and during this time treatment in the form of splint immobilization and of the sanatorium type of care should be given. Again, it is axiomatic that the tuberculous patient must demonstrate resistance and an ability to localize infection before the surgical attack is made.

The best results at the Massachusetts General Hospital have been obtained in cases in which the hand has been disabled by the sequela of an infection that has become quiescent, that is by fibrosis of the tendon sheath, different tendons, and rice bodies.

HARVEY S. ALLEN, M.D.

Kleinenberg, H. E., Neufach, S. A., and Shabad, L. M. Endogenous Blastogenic Substances. *J. Cancer* 34: 39-43

Within the past eight years experimental studies of the production of tumors with chemically pure substances have been carried out on a large scale and have yielded important results. The question arises, however, as to how far the experimental conditions resemble those under which tumors originate in man and whether some endogenous blastogenic substances such as certain estrogens analogous to the sexogenous substances now known may not occur in the human or animal organism.

The study of the structure of certain exogenous carcinogenic agents, namely the polycyclic hydro-

carbons, has shown them to bear a close resemblance to substances which are known to originate in the human body, as for instance the sex hormones, bile acids, and cholesterol. Important support for the hypothesis that there are carcinogenic substances of endogenic origin was furnished by the preparation of methylcholanthrene from deoxycholic acid. For final proof of the endogenic origin of blastogenic substances, it is necessary to obtain from the human or animal body affected with tumors certain chemicals which will produce tumors in animals. A number of indirect proofs of the possible endogenic origin of blastogenic substances have been advanced and several attempts have been made to discover them but no direct experimental proof of the presence of endogenic blastogenic substances has yet been found.

On the assumption that endogenic carcinogenic agents might belong to a group of substances more or less akin to the exogenous carcinogens already known to us, the authors decided to use benzol as an extractive, inasmuch as it had proved to be an efficient solvent of a number of carcinogenic hydrocarbons. Considering the possibility of blastogenic substances circulating throughout the animal organism, the authors believed that they might be found outside of the tumor, and might be obtained from some organ which had not been affected by the growth. The first attempts were directed toward the liver, the organ which is undoubtedly connected with the conversion of sterols, and in particular is the site of formation of the bile acids.

Livers were obtained from 67 patients, of whom 41 had died of malignant neoplasms, mostly cancer, while the remaining 26 had died of various other diseases and gave no history of malignant growth. All the experiments were carried out on 537 white mice, which were two or three months old when the experiment was begun. The extract was administered subcutaneously by means of a syringe into the left side of the body. A dose of from 0.2 to 0.4 c cm was given repeatedly for from four to eight, and sometimes as many as twelve times at intervals of from ten to twenty or thirty days. The period from the beginning of the experiment to the last injection thus varied from one to ten months.

Injections into mice of benzol extracts of the liver of persons who had died of cancer resulted in a large number of tumors, benign and malignant, originating both at the site of injection and, more frequently, at a distance. A comparison of the number and appearance of the tumors observed in these experiments with the number and appearance of those occurring spontaneously in the strain used, which has been under observation for twelve years, proves beyond doubt that the tumors in the experimental mice were produced by the injected liver extracts. The injection of bile extracts from cancer patients, as shown by previous investigations, produces approximately the same number of tumors as the injection of liver extracts from cancer patients. The extracts used in both series of experiments—i.e., those with liver extracts and those with bile extracts

—were obtained from persons with cancer of different forms and locations and consequently the results are not to be attributed to any particular peculiarities of cancer affecting the stomach, the lung, or other organ, but to the general properties typical of malignant tumors of all kinds. The authors' study gives sufficient grounds for concluding that extracts made from a liver devoid of any metastases may cause tumors, i.e., that the blastogenic agent may be present outside the tumor itself. Extracts prepared from the livers of persons who had never suffered from cancer produced considerably fewer tumors than "cancer extracts," i.e., extracts from persons suffering with cancer, and at a much later age. The accumulated data support the conclusion that the tumors observed, or at any rate the great majority of them, were caused by the injected extract. The resulting malignant and benign tumors closely resembled, both in their morphology and in their variety and location, the tumors observed in mice following the injection of exogenic blastogenic substances.

The origin of tumors at the site of the injection of the liver extract might conceivably be attributed to the chronic irritation produced and the subsequent repeated regeneration, i.e., to a non-specific local irritating action, which, of course, actually took place. Opposed to this point of view are all the observations made in experimenting with chemically pure exogenic substances, which clearly show that there is no connection between the origin of the tumors and the irritating properties of the agent. In the second place, no tumors were found at the site of the injections of bile extract, although bile extracts have a far greater irritating action than liver extracts. In the third place, it is worth noting that liver extracts from non-cancerous patients had no less an irritating effect than cancer extracts, yet the number of tumors they produced was far smaller. Last, but not least, neither non-specific irritation nor local chronic inflammation can possibly account for the origin of tumors remote from the injection site, which were very numerous in the authors' experiments.

In spite of all this, it is necessary to consider the question as to whether the authors truly succeeded in extracting blastogenic substances from the human liver or whether these substances were obtained as a result of their treatment of the organ and the preparation of the extract. Various considerations induced them to conclude that the benzol extracts employed by them contained only such blastogenic substances as had previously existed or had been previously formed in the liver. The investigations do not yield any data concerning the chemical nature of endogenic blastogenic substances.

JOSEPH K. NARAT, M.D.

Hiegar, I. The Examination of Human Tissue for Carcinogenic Factors. *Am J Cancer*, 1940, 39: 496

Numerous experiments have been carried out to see if a carcinogenic factor could be detected in ex-

tract of tumors or of tissues and body fluids from human subjects who have died of cancer. The method has been used, as test methods: applications to the skin of the mouse, fluorescence spectroscopy and inhibition of the dehydrogenase system such as is brought about by derivatives of some carcinogenic compounds.

Shabad, working in Leningrad, has been the first to report success in this field. His experiments were carried out on mice with liver tissue obtained from a woman dying of gastric cancer with numerous metastases, but none in the liver. Three tumors were obtained: 2 sarcomas in male mice after eight and three-quarters and nine months, respectively, and a carcinoma of mammary type in a female after nine months. The experiments described are mainly an examination of Shabad's discovery and the extension of it to other tissues.

Primary cancer of the liver is of common occurrence among the Bantus of South America, the Javanese and the inhabitants of some parts of Eastern Asia. These facts suggest certain possibilities: (1) that in some races, such as the Bantus, the liver acts as a depot for some carcinogenic agent, and (2) that the incidence of cancer in these areas is a consequence of some dietetic factor. The adrenal and the prostate glands have been used also for the preparation of extracts. The adrenal because in recent years many new compounds have been isolated from it and the prostate because some pathologists believe that considerable number of enlarged prostates have malignant areas. Other organs, which are known to contain toxins in precancerous condition and obtainable in quantity from the operating room were also used.

The number of animals and procedures used were as follows: Injection of extract of liver: 367 animals; Injection of extract of adrenal gland: 4 animals; Injection of extract of prostate gland: 20 animals; Injection of lard (controls): 70 animals; Painting with extract of liver: 4 animals; Feeding: 35 animals.

Eleven spindle-cell tumors were obtained in 367 mice receiving subcutaneous injections of various extracts of European and Bantu livers.

Of these 367 mice, 60 were females and in these the tumors occurred. The lack, however, of sufficient quantity of any one extract for an adequate test upon male and female mice prevented any conclusive experiment on the susceptibility of the two sexes. Extracts of the adrenal and prostate glands have so far given negative results.

Obviously, there is no simple relation between cancer in human subject and cancer-producing factor in the liver. It is unknown why only certain livers yield active extracts, and, beyond the slight indications given by the method of sapotification and extraction, there is nothing to suggest the nature of the compound concerned. The small proportion of active extracts seems to exclude any ordinary constituent of the liver and bile such as deoxycholic acid.

JOSEPH K. NAR. M.D.

GENERAL BACTERIAL, PROTOZOAN AND PARASITIC INFECTIONS

Number E. Specific Diagnosis and Therapy of Actinomyces (Specifics Diagnosis und Therapie der Actinomykose) Klaus Bickhardt 440, 776.

I. detailed work Neuber, Director of the Dermatological Clinic of the University of Budapest, reports on a new specific treatment (autochemotherapy) in cases of actinomycosis. He analyzes the value of various diagnostic and therapeutic methods and gives a critical survey of the types of actinomycosis which most readily respond to the different and particularly specific therapeutic methods.

The clinical material consists of approximately 300 patients. Neuber points out a fact which has not been sufficiently appreciated in other reports, namely that bacteriological proof and cultures of the ray fungus do not suffice for diagnosis; the clinical picture has to be considered in all cases, and the latter must show the characteristics of chronic specific inflammatory process. Ray fungi are found frequently merely as saprophytes in various ulcerous processes of the skin without influencing the development of the clinical symptoms. Whether we have to deal with saprophytic or pathogenic strain must be determined with culture and preparation of vaccine from it, the latter to be used for study of allergic intracutaneous reactions. If the reaction in the patient (not anergic) is positive, we can be sure that the fungus is of pathogenic origin and is the causative agent of the illness in question.

In the diagnosis of actinomycosis allergic reactions play an important part. However dependable antigens are necessary they must be specific and sensitive. Fresh vaccine is of the utmost importance. For the preparation of the vaccine one uses, if possible, cultures originating from the patient after one or two inoculations. A polyvalent antigen (serum) prepared from 6 to 8 different strains proves most successful. Complement combination appears valuable particularly for the early diagnosis of ray fungus in the internal organs. The difficulty lies in the preparation of dependable antigen. Among the specific therapeutic methods the specific vaccine treatment must be stressed as one which gives very good and dependable results.

Latel Neuber has developed the specific treatment with serum taken from convalescing patients, blood transfusions and chemotherapy all of which methods have given good results. Every one of these methods represent great therapeutic advantage and in some aspects they complement each other. Vaccine treatment should not be attempted in anergic condition, but if this overcome vaccine being active immunizing factor shows the best permanent results. On the other hand, serum from convalescing patients, specific blood transfusions, and chemotherapy can be used also during the anergic stage because in these methods the patient acquires immunizing substances which

he need not produce himself as is the case with vaccination, however, the effect of these passive immunization methods is not as permanent, particularly when convalescent serum is used. In consideration of this fact Neuber gives in the beginning, particularly in cases of anergic patients, passive immunization (eventually combined with gold—Solganal B of altogether 2.5–5.0, pro dosi 0.01–0.25), later, when the anergic condition has been overcome, the author gives active immunizing treatment which most effectively guards against relapses.

Autohemotherapy represents an energetic therapeutic measure. Eight cases were treated with this method alone and all of the patients recovered completely. In 9 cases autohemotherapy was combined with gold treatment. These cases also showed excellent results. The value of this method lies in the fact that it can be used also in cases of anergic patients and that the material is easily obtainable, in contrast with methods which use convalescent serum and blood transfusion. In the course of autohemotherapy the patient receives, at five day intervals, 5, 10, 15, and 25 c cm of blood. In the cases cured entirely by autohemotherapy from 12 to 15 injections were necessary.

In conclusion, Neuber points out that these specific therapeutic measures will cure patients with actinomycosis almost without exception. Success is based upon the following conditions: only dependable antigen should be used, dosage should be determined according to biological rules, and no vaccine treatment should be given in serious cases during the anergic stage.

Patients with actinomycosis who are unable to recover their ability to react even with the help of gold and passive immunization methods are incurable, quite hopeless are also such cases which reveal a degeneration of the vital internal organs, for instance, parenchymatous and amyloid degenerations. Six illustrations accompany the report.

(DUMONT) HILDA H. WULLEN

SURGICAL PATHOLOGY AND DIAGNOSIS

MacGregor, R. G. S., Richards, W., and Loh, G. L.
The Differential Leucocyte Count. *J. Path. & Bacteriol.*, 1940, 51: 337.

The differential leucocyte count, widely used as an aid to diagnosis, has also been used as a means of determining physiological variations and in the assessment of normal standards in different environmental conditions. Two common errors occur: (1) errors due to variation in the method of taking blood for films, and (2) errors due to variation in the method of performing the count. Three different methods of counting were employed: (1) the straight or edge count, (2) the "battlement" or "palisade" count, and (3) the "cross-sectional" count.

Differential leucocyte counts performed on slide films showed marked variations, particularly in the percentage values of polymorphonuclears and lymphocytes, in different areas of the same film.

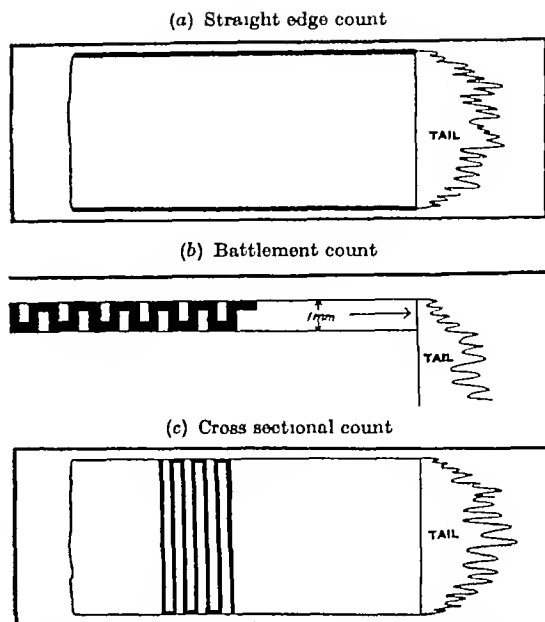


Fig. 1. Common methods of counting films. The areas examined are shown in black in all three diagrams.

Three common methods of performing the differential count were shown to give, on the same film, variations which exceeded 20 per cent in certain types of cells under certain circumstances.

Examination of all fields in a series of full-sized films and in films of varying dimensions showed that cells of different types had different distributions, but that there is a general relationship between the distribution equation of one type of cell and that of any other type. This general relationship varies to some extent for the individual film, but for a series of films is relatively constant.

This relationship was ascertained from examination of consecutive segments throughout the films, the results of which were subjected to Fourier analysis to determine the nature of the wave distribution of cells, and factors were obtained which could be expressed in the form of graphs. These graphs correlate three common methods of performing the differential leucocyte count with the count determined from examination of all cells in the film, and allow corrections to be made which render these methods comparable, the degree of correction varying with the type of cell and with the percentage found for the type in question.

The accuracy of these corrections was tested upon a series of differential counts covering a wide range not included in the series from which the graphs were constructed, the average error was found to be less than 3 per cent. When average results obtained from two methods are being compared, a correction of as much as 20 per cent may result in certain cases.

This degree of accuracy would hold for averages of 6 films of films made with sufficient care to ensure that the standard type of film is maintained. Variation from the typical film would decrease the accuracy with which such factors can be applied, although it would still give a considerable degree of correction.

A modification of the degree of accuracy with which the correction could be applied would also be brought about by including in the series blood which gave values for total cell count per cubic millimeter outside the normal range, since physical factors governing the spread of film would be affected to some extent when the cell concentration is altered to the degree possible in all pathological cases.

The chief scope of this type of standardization of the differential count lies in its application to the determination of the physiological values of blood in groups of normal individuals of different types or under different environmental circumstances, or to variations in cell percentage which are not accompanied by extreme alterations in total values for red blood cell per cubic millimeter.

The type of differential slide film count which gives the closest value to that found by count of the whole film is the battlement edge count, performed in the manner described. It does consider variation of both edges to diminish errors caused by asymmetry of the film.

Counts performed on cu and ja tend to give slightly higher value for polynuclears and lower value for lymphocytes than those given by the slide film method and correspond reasonably closely to the straight edge type of slide film count.

J. M. Mow, M.D.

EXPERIMENTAL SURGERY

Siebert W. J. and Loose F. Comparative Studies on the Absorption of Sulfanilamide. *J. Lab. & Clin. Med.* 1940, 26, 37.

Comparative studies were made on the absorption of sulfanilamide administered as a solution in glycerol, sodium lactate and a ordinary tablets. Six apparently healthy adults and patients with pernicious anemia were studied. Higher blood concentrations of free sulfanilamide were obtained when the drug was given in the solution than when an equivalent dosage was given in the form of tablets. With the solution the rate of sulfanilamide elimination was more rapid and the loss of blood carbon dioxide combining power was less and in the presence of chlorhydrates the rise in the blood concentration of sulfanilamide was comparable to that seen in the normal subject. Therefore, gastric hydrochloric acid is not required for the absorption of sulfanilamide into the blood stream.

WALTER H. NADLER, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 72

MAY, 1941

NUMBER 5

SURGERY AND THE BASIC SCIENCES

RECENT STUDIES OF THE FACTORS INVOLVED IN THE COAGULATION OF BLOOD, INCLUDING A REVIEW OF VITAMIN K

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FACTORS INVOLVED IN THE COAGULATION OF BLOOD

ACCORDING to present concepts (1 and 3), there are two phases to the coagulation of blood and four substances are primarily involved. These are generally expressed as follows:

(a) Prothrombin + thromboplastin + calcium = thrombin

(b) Thrombin + fibrinogen = fibrin

Three of the primary factors are represented in (a) and these react to form thrombin which in turn reacts with the fourth substance, fibrinogen, to form the insoluble protein fibrin. The bleeding tendency in any given case may not be adequately explained without consideration of related vascular phenomena (2). A classification of hemorrhagic disease based on defects of the coagulative mechanism has been presented by Quick (3), who points out the fact that a defect in any of the four factors involved in the clotting mechanism may keep the reaction from reaching the state of completion.

It should be pointed out, however, that there are numerous theories regarding the substances and processes concerned in coagulation, and that the only point conceded by all theories is the essential rôle of fibrinogen.

Prothrombin The plasma content of this substance is relatively constant for any given species (4). It is the precursor of thrombin, which in turn is the active coagulative "enzyme." Prothrombin is thought to originate in the liver (5). It has been described (6) as a carbohydrate-containing protein associated with the globulin fraction of the plasma proteins. It is sensitive to acid, inactivation beginning at pH 4.8 and reaching completion at pH 3.5, on the alkaline side inactivation begins at pH 10. Inactivation by heat is partially complete at 40° C for thirty minutes, and virtually complete at 60 degrees.

Determinations of the activity of plasma prothrombin have been made largely according to either the method of Quick (7) or that of Warner, Brinkhous, and Smith (8). A method particularly suited for infants has been described (9). There are various figures for the concentration of prothrombin in the blood below which hemorrhage is likely to occur. As much as 80 per cent of the normal plasma prothrombin activity may be lost before the coagulation time is appreciably increased, according to Quick and his coworkers (10). Butt (11) has obtained results which indicate that bleeding may occur when the prothrombin is considerably higher (from 40 to 50 per cent of normal), and also that what appears to be cholemic bleeding may occur with a normal prothrombin time (12). Various results have been obtained for the prothrombin content of the blood.

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plasma of newly born infants (13, 14, 15, 16, 17). However it appears that the relatively high prothrombin activity which may be expected during the first day of life is likely to decline from the second to the sixth or eighth day and after that increase, and that during this time there may be considerable daily variation in the plasma prothrombin level. The influence of Vitamin K on prothrombin will be considered when this vitamin is reviewed.

The influence of storage upon the prothrombin content of blood is a question of practical importance. The prothrombin time of stored blood has been found to be prolonged (18) the decrease in activity paralleling the duration of storage. These results have been confirmed (19). Little change in the prothrombin activity of stored blood has also been reported (20). The difference in results may be due to a difference in the methods employed to determine prothrombin activity (19) or to some variable factor involved in the stability of prothrombin.

Thromboplastin. The substance contained in platelets and in many tissue extracts, which acting in conjunction with calcium, converts prothrombin into thrombin, is known as thromboplastin or thromboklasin. The latter term implies that it is an enzyme activator. Although the actual nature of the reaction is unknown, yet it is of interest to know that trypsin can also convert prothrombin into thrombin (21, 22, 23). The brain, lung, and thymus are particularly rich tissue sources of thromboplastin, so far as the blood itself is concerned the platelets are the recognized source, although the plasma itself may make some contribution to the activation of prothrombin (24). Howell's theory teaches that thromboklasin inactivates antiprothrombin, which some believe is heparin.

The chemical nature of this activator suggests that it may be both protein and lipid in character. A potent activator for the clotting of plasma was obtained from the phosphatide fraction of horse blood platelets (25) by Chaffin, Bancroft, and Stanley Brown. They suggested that the natural activator for the blood-clotting mechanism may be a specific protein complex with cephalin. A thromboplastic protein prepared from lung tissue has been studied (26). From this protein was isolated a phosphatide fraction and with the removal of the lipid group the protein lost its thromboplastic properties. The protein was capable of stimulating antibody formation. It was further found (27) that the treatment of the thromboplastic protein from lung with heparin resulted in a displacement of

the phosphatide fraction by heparin and that the heparin-protein complex had marked anti-coagulant properties. The importance of cephalin in the activation of the precursor of thrombin led to the suggestion (28) that denaturation phenomena following the shedding of blood make more cephalin available than can be taken care of by the antithrombotic factors contained in blood. Leathes and Mellanby (29) reported the isolation of a non-lipoid thromboklasin from brain tissue and daboia venom. These workers also report that lecithin increases the activity of thromboklasin. This finding is in contrast with the more generally accepted view. Chaffin and Cohen (27) continuing their observations on the thromboplastic properties of cephalin, found that a lysophospholipid preparation containing 30 per cent lysocephalin was without influence upon the blood-clotting mechanism.

The use of a purified thrombin solution as a hemostatic agent has been suggested (30). The potency of various commercially available thromboplastic substances has been studied (31). These included snake venom, bovine brain extract, beef lung extracts, bovine blood extracts, and concentrated horse serum. Of the 27 products examined, 9 were found to be practically inactive, and the only products found to be significantly active were those suitable for local or oral use.

A study of the mechanism of the action of saliva upon blood coagulation (32) indicates that saliva accelerates the coagulation of blood by acting as a thromboplastin. The active principle can be precipitated by ammonium sulfate. It is thought to be cellular in origin and may be a lipoprotein.

Since the platelets are an important source of thromboplastin, it follows that qualitative or quantitative abnormalities in the platelets may alter the coagulability of the blood. The prothrombin conversion rate of the hemophilic is extremely slow and is brought to normal by the addition of a small amount of thromboplastic agent (33). The clotting of hemophilic blood by crystalline trypsin as reported by Tyson and West (34) has been confirmed by Ferguson (35) who believes that a deficiency in thromboplastic enzyme in the plasma is a logical explanation of the delay in coagulation in hemophilia. Howell, in a recent review of the problem of hemophilia (36) indicates that the defect may not be merely a matter of alteration in the structure of the platelet which renders it more stable than normal, but that some element of the plasma (37) which normally has to do with the agglutination and breakdown of the platelets may be at fault. Idiopathic

thrombocytopenic purpura illustrates the effect which a marked decrease in platelets may have upon the coagulability of the blood and the tendency to bleed (35). This condition also shows that there is normally a wide margin of safety between the number of platelets necessary for normal clotting and the concentration at which bleeding may occur. The decrease in available thromboplastin resulting from a thrombocytopenia does not adequately account for the importance of the platelet in blood clotting and related vascular phenomena (see section on fibrinogen). It has been shown that Vitamin K fails to alter the abnormal coagulation of hemophilia and thrombopenia (85, 86).

Calcium It is quite generally held that ionized calcium is essential for the conversion of prothrombin into thrombin (36, 37). That calcium is merely a catalyst and that this reaction will occur spontaneously in the presence of water, acetic acid, and oxalic acid has been claimed (38). Mellanby and Pratt (38) found that less than 0.3 mgm per cent of calcium is required for the coagulation of fowl plasma by thrombokinase. The minimal calcium-ion concentration at which the coagulation of diluted citrated plasma occurred was 0.35 mgm for human, and 0.24 mgm for dog plasma, according to Ransmeier and McLean (39). They found further that the minimal coagulation time for both dog and human plasma is approached above a calcium-ion concentration of 1.25 mm per liter. Cranc and Sanford (40) studied the coagulation time and serum calcium content and found a normal clotting time with the calcium content of serum ranging from 5 to 20 mgm per 100 c.c. A low serum calcium in a case of hypoparathyroidism was accompanied by a normal clotting time (41). There is some evidence to indicate that an actual compound of calcium and prothrombin occurs as an intermediary product in the conversion of the latter into thrombin (42, 43).

It has been shown by Ferguson that calcium, besides being an essential factor in the conversion of prothrombin into thrombin, alters the platelets in some way so as to disturb the osmotic pressure within the platelet and result in its rupture (44).

Thrombin Evidence favoring the belief that thrombin is an enzyme which acts specifically on fibrinogen to form fibrin has been summarized (45). The quantitative relationship between calcium and cephalin in experimental thrombic mixtures has led to the conclusion (46) that an intermediary substance in thrombin formation is made up of a colloidal complex of all three precursors

of thrombin, viz., prothrombin, cephalin, and calcium. Extension of the original observations (47) as to the ability of crystalline trypsin to clot blood without the aid of cephalin and calcium indicates that in small concentrations the activity of trypsin is dependent upon calcium (48). It is postulated that thrombin formation may be the mobilization of cephalin and calcium on the surface of protein (prothrombin), with the elaboration of a substance capable of clotting fibrinogen. Study of the action of thrombin upon a solution of purified fibrinogen indicates that all of the fibrinogen nitrogen appears as fibrin nitrogen (49). The action of thrombin on fibrinogen is considered to be a hydrolytic one of which the formation of fibrin is an intermediary step (50). That 9 or 10 per cent of fibrin nitrogen does not appear as fibrin is also indicated. Other workers (49) say this discrepancy represents the solubility of fibrin.

The chemical nature of thrombin is similar to that of prothrombin (6). In a saline solution thrombin is permanently inactivated by acid at pH 3.5, and reversibly inactivated in the zone between pH 3.5 and 4.1. According to Glazko and Ferguson (51), thrombin preparations are most stable between pH 4 and 5. The inactivation of thrombin by serum albumin has been demonstrated by Quick (52). By means of a standard thrombin solution blood can be tested for the presence of heparin or other anti-thrombogenic agents (53).

Fibrinogen This soluble protein, which probably originates in the liver (83, 84), belongs to the globulin fraction of the plasma proteins. The action of thrombin converts it into the insoluble protein fibrin. When blood clots, the fibrin precipitates in fine needles and threads which enmesh the cellular constituents of the blood. Tocantins (54) has shown that the retraction of a clot is accompanied by the bending and twisting of the fibrin strands and that the adherence of platelets to the strands of fibrin is instrumental in bringing about the normal shrinkage of the clot. The fibrin framework of the clot is strengthened by the accumulation of platelets at the intersection of fibrin needles or strands.

A reduction in plasma fibrinogen from the normal range of 0.2 to 0.4 per cent has been reported to occur in certain deficiency diseases (55). Smith, Warner, and Brinkhous (56) found that liver injury did not reduce the plasma fibrinogen of dogs so readily as it did the prothrombin, and that the latter returned to normal less readily than the former, also, that abscesses which elevated the fibrinogen content of the blood were

without effect upon the plasma prothrombin level. A congenital deficiency in fibrinogen has been reported by Macfarlane (57). This worker has also shown that an operation may cause some change in the structure of fibrin which results in lysis and fragmentation of the clot following the trauma (57a).

Anticoagulant. Substances which interfere with the coagulation of blood may do so by inhibiting the action of any of the substances involved in the reactions which lead to the formation of fibrin. The *in vitro* anticoagulants usually employed interfere with the clotting of blood by combining with calcium. A study of the effect of varying amounts of sodium oxalate upon the clotting of plasma has been reported recently (58). The *in vivo* anticoagulant that has aroused the most study and interest is heparin. It is known that this substance will prevent the clotting of blood whether shed or circulating. The failure of blood to clot after peptone or anaphylactic shock has been explained by an increase in the concentration of heparin in shocked plasma (61) and the fact that this heparin originates in the liver is indicated by the fact that no antithrombin is found in the blood of shocked liverless dogs (59). Not only has the presence of antithrombin been demonstrated in the blood of shocked animals (60) but the isolation of crystalline heparin from the blood of dogs after anaphylactic shock has been reported as well (6).

The manner in which heparin prevents the coagulation of blood is not entirely understood. It has been suggested (63) that heparin forms an antithrombin by combining with a serum protein and that the serum protein involved is probably the albumin fraction (64). The heparin-protein complex then combines with thrombin thereby preventing it from reacting with fibrinogen (63). It has been shown that neutral salts are necessary for this reaction (63). It has also been reported (65) that heparin prevents the conversion of prothrombin into thrombin and that for this effect some non-diffusible constituent of the plasma is required. Salamune, a basic protein that combines with heparin (66) is a anticoagulant acting in combination with heparin, and this anti-coagulant effect has been shown to be due to the anti-prothrombic effect of the combined heparin and salamune (67). A comparison of the anti-coagulant effects of heparin and of diethylamine indicates that these substances possess similar anti-coagulant properties. Cephalin was found to inhibit the anti-coagulant effects produced by heparin in directly proportional amount (68).

The separation of a lipid fraction from the brain and spinal cord of various animals which was capable of inhibiting the coagulation of blood plasma has been reported (69). This lipid is contained in the cerebroside fraction and is associated with sphingomyelin. In a further study it was shown that the sulfuric-acid esters of the cerebroside, cerebrin and kernalin, possess marked anti-coagulant activity. The author also points out that sulfuric-acid esters of polysaccharides act as strong anticoagulants. The anti-coagulant properties of various sulfur compounds such as cystine and taurine have been reported (70). Others (69) claim that a variety of organic substances with acidic groups inhibit clotting and that cystine is without anti-coagulant effect, while its hydrochloride is an anti-coagulant because of its acidity. However this hardly seems an adequate explanation for the fact that cystine and methionine administered orally to human subjects prolonged both the bleeding and coagulation time (69).

The presence of a circulating anti-coagulant has been reported recently in a patient with a generalized lymph-node tuberculosis (71). This anti-coagulant increased the coagulation time of normal blood and was found to be associated with the globulin fraction of the plasma proteins. It was relatively thermostable and non-diffusible and would not react with saline as does heparin. Quick has confirmed (72) and extended the observations of Rodenck (73) that the decreased coagulability of the blood in sweet clover disease is due to a disturbance in the prothrombin. He found that spoiled sweet clover fed to rabbits would cause the prothrombin level of the blood to drop to a low level and that the hemorrhagic level paralleled the reduction in prothrombin. Whether there is an inhibition or destruction of the plasma prothrombin is not known. A scheme for the concentration of the active hemorrhagic principle of spoiled sweet clover has been reported (74). By this method a 300-fold concentration has been effected, and 6 gm. of the concentrate fed to a standardized susceptible rabbit reduced the plasma prothrombin to 1 per cent of normal in from forty to forty-eight hours. While the identity of the active principle of the extract is still unknown, certain classes of compounds have been eliminated.

Experimental and clinical studies on the use of intra-venously injected heparin as a means of preventing thrombus formation has been reported (75, 76, 78, 81). Its use after mesenteric thrombosis resulted in no recurrences following operation and is due to the prevention of

thrombosis after splenectomy is suggested (77) The ability of heparin to prevent the coagulation of blood was found to be the same *in vivo* as *in vitro* (78) The rate of removal of intravenously injected heparin from the circulation of the dog was found to be proportional to its concentration if 1 unit (1/100 mgm of the barium salt of heparin) or less of heparin was present per c cm of blood, and at a constant rate (2 units per kgm per min) when 2 units or more were present per c cm of blood (78)

VITAMIN K

Chemistry Vitamin K₁ from alfalfa has been isolated in pure form (1-4) The substance is a light yellow oil which changes to a crystalline form on cooling an acetone or alcohol solution The behavior of this substance upon hydrogenation and oxidation, its sensitivity to light and alkali, and its absorption spectrum suggested a quinoid structure (3) Reasoning from degradation products of the vitamin, the Doisy group first suggested that K₁ was 2-ethyl-3-phytyl-1, 4-naphthoquinone (5) Fieser and his coworkers compared Vitamin K₁ from alfalfa with different synthetic naphthoquinones in regard to their absorption spectra and reactions with sodium ethylate, and as a result they published the first correct formula for Vitamin K₁ 2-methyl-3-phytyl-1, 4-naphthoquinone (6) This structure was confirmed in a later publication by the Doisy group (7) Three independent syntheses of Vitamin K₁ have been reported (8-11)

Vitamin K₂ from putrified sardine meal is a light yellow crystalline solid with a melting point between 50.2 and 52° C (3) The Doisy group (12) found K₂ to be a 2, 3 disubstituted 1, 4-naphthoquinone with a methyl group in the 2 position A somewhat different structure has been suggested by Fieser (6)

Synthetic substances with K activity The first report on a simple synthetic compound with anti-hemorrhagic activity was that by Almquist and Klose (13) who found that phthiocol (2-methyl-3-hydroxy-1, 4-naphthoquinone) possessed some Vitamin K activity This substance had been isolated from tubercle bacilli (14) and later synthesized (15) The activity of 2-methyl-1, 4-naphthoquinone was investigated by several workers (16-18) Its exceptionally high activity was first recognized by Ansbacher and Fernholz (16) During the past year a tremendous number of synthetic substances have been assayed for Vitamin K activity Riegel (19) has presented an excellent summary of this extensive work Some forty-five synthetic compounds have been shown

to possess anti-hemorrhagic activity Of particular interest are the water-soluble active substances which are suitable for parenteral administration Some of these will be considered in more detail later In addition to these substances, some sixty-two synthetic products have been proved to be inactive From this work a number of generalizations relating structure to activity may be advanced (19)¹

1 The 1, 4-naphthoquinone structure is most essential

2 The greatest activity occurs when a methyl group is in the 2 position If one hydrogen atom in the 2-methyl group is replaced by another group the activity is greatly diminished

3 Substitution of alkyl or hydroxyl groups in the benzenoid ring of the 1, 4-naphthoquinones either destroys or greatly reduces the activity

4 Substitutions in the 3 position of 2-methyl-1, 4-naphthoquinone also lowers the activity On a weight basis, the groups in the natural Vitamins K₁ and K₂ lower the activity of 2-methyl-1, 4-naphthoquinone, but all have the same activity on a molar basis

5 Derivatives of active 1, 4-naphthoquinones, such as hydroquinones, quinhydrone, hydroquinone esters, or even 1, 4-aminonaphthols exhibit Vitamin K activity

Mode of action of Vitamin K, rôle of the liver

The existence of an anti-hemorrhagic vitamin was first suggested by Dam (20) who observed a hemorrhagic tendency in chicks maintained on a special fat-free diet. It was shown (21) that the defect in the clotting mechanism in these animals was not due to a disturbance in the fibrinogen, calcium, or thrombocytes of the blood, or to a deficiency in the thrombokinase of the tissues, and later (22-23) a deficiency in prothrombin was found to be responsible Apparently, the mechanism by which Vitamin K prevents a hemorrhagic tendency is to stimulate the production of plasma prothrombin (22, 23, 24) The exact manner in which Vitamin K is utilized in the production of prothrombin is not yet known Vitamin K does not act as prothrombin *in vitro* (25) The fact that prothrombin precipitates from the plasma of normal chicks did not show Vitamin K activity was interpreted by Dam and his associates (25) to mean that Vitamin K is not a prosthetic group in the prothrombin molecule, but that its presence in the tissue stimulates prothrombin production²

¹Since this was written an excellent review of this subject by Fieser, Tishler and Sampson has appeared in *J. Biol. Chem.* 1941, 137, 659.

²It has recently been suggested (118) that Vitamin K may constitute a prosthetic group in an oxidation-reduction enzyme system possibly related to liver cathepsin.

Experimental (26-34) and clinical (35-43) studies appear to have demonstrated that the liver is essential for the manufacture of prothrombin and the utilization of Vitamin K. Partial hepatectomy in the rat (26) and total or partial hepatectomy in the dog (30-33) results in a marked decrease in plasma prothrombin. Controlled experiments demonstrated that the defect in the clotting mechanism which follows such procedures could not be explained on the basis of anesthesia, hemorrhage, blood dilution, laparotomy, or a decrease in plasma fibrinogen (26-30). A fall in plasma prothrombin also occurs following mechanical trauma to the liver of the dog (31-33) and after liver damage produced by carbon tetrachloride in the rat (27) and by chloroform anesthesia in the dog (28). In the last instance, the prothrombin deficiency could be produced without a change in the plasma fibrinogen. The hypoprothrombinemia produced in the rat by carbon tetrachloride poisoning and in the dog by chronic chloroform intoxication does not respond to Vitamin K administration (27-34). This experimental evidence is supported by an increasing number of clinical reports (35-45, 104) stressing the fact that hypoprothrombinemia in patients with extensive liver damage fails to respond to the administration of Vitamin K, and pointing out the existence of a prothrombin deficiency in certain diseases of the liver (Laennec's cirrhosis, Banti's disease) (45). There is some evidence to indicate that Vitamin K may be stored in the liver (31-35).

The liver plays a second indirect rôle in the utilization of Vitamin K by furnishing bile which is essential for the absorption of fat-soluble Vitamin K from the intestine. A hypoprothrombinemia in certain patients with jaundice was first demonstrated in 1935 by Quick, Stanley Brown, and Bancroft (46). It was also shown that the hemorrhagic tendency observed in dogs with a chronic biliary fistula was due to a prothrombin deficiency and could be prevented by the return of bile to the intestinal tract (47). Early in 1937 Quick (48) suggested on theoretical grounds that these observations might be explained on the basis of inadequate absorption of a substance similar or identical with Vitamin K because of the absence of bile in the intestine. Greaves and Schmidt (49, 50) demonstrated that the hemorrhagic tendency in rats with a biliary fistula was associated with a hypoprothrombinemia which could be prevented by the oral administration of bile or of alfalfa concentrates rich in Vitamin K. Further experimental studies have demonstrated that bile is necessary for the absorption of Vita-

min K and that the hypoprothrombinemia associated with obstructive jaundice or biliary fistulas in rats (50, 54-55), dogs (51-52) and chicks (53, 56) can be prevented by the administration of Vitamin K and bile salts. The first report on the use of Vitamin K in the treatment of human cases was by Warner, Brinkhous, and Smith (53). Shortly after this, two other reports appeared (57-58) and since that time this work has been confirmed many times (for literature see reference 19).

EXPERIMENTAL AND CLINICAL K DEFICIENCIES

1. *Dietary deficiency.* A K-avitaminosis can be readily produced by dietary means in chicks and various avian forms, but early workers were unsuccessful in producing a dietary deficiency in the ordinary laboratory mammals (rats, guinea pigs, dogs) (59). More recently several reports have appeared which indicate that a dietary deficiency may be produced in mammals. It has been reported that mice on a Vitamin K-free diet develop a prolonged bleeding time (60). Greaves (54) observed a hemorrhagic tendency in 12 of 77 rats raised for a considerable time on a Vitamin K free diet. A prothrombin deficiency has been produced in rats with a diet containing a high percentage of mineral oil, which apparently interferes with the absorption of Vitamin K from the intestine (61). The difficulty in producing a dietary K-avitaminosis in mammals may be due to the bacterial synthesis of Vitamin K in the intestine. It has been shown (62-64) that certain microorganisms, including the colon bacillus, are capable of synthesizing the vitamin in food, feces, or pure culture. Vitamin K activity has been found in the horse, cow, sheep, hog, and human feces (65). Greaves has shown (54) that an ether extract of the feces of rats on a Vitamin K free diet completely protects young chicks from Vitamin K deficiency when added to the basal diet.

A K-avitaminosis in man on a dietary basis appears to be quite rare. After week on a Vitamin K-free diet, the normal individual shows no deficiency in prothrombin (52). Recently however some evidence has appeared which seems to indicate that a dietary deficiency may be responsible for a K-avitaminosis in man (66-67, 86).

2. *Liver and biliary tract disease.* The Vitamin K deficiency which occurs in laboratory animals and in patients with biliary obstruction, biliary fistula, and liver injury or disease has been cited above.

3. *Vitamin K deficiency in the newborn.* In 1937 Brinkhous, Smith, and Warner (68) reported that the prolonged clotting time which

had previously been demonstrated in newborn infants (69) and in hemorrhagic disease of the newborn (70) was associated with a hypoprothrombinemia. Recently a considerable number of studies on this problem have appeared. The prothrombin level of the infant although apparently normal at birth (71-73) soon begins to fall so that during the first few days of life the plasma prothrombin may reach dangerously low levels (71-79). It apparently returns to normal in about a week. The cause of this "physiological hypoprothrombinemia" is not yet understood. It has been suggested that it is due to a lack of Vitamin K synthesis in the intestine because of the absence of a bacterial flora (72, 74, 78), or to functional immaturity of the liver which does not properly produce prothrombin or which produces bile that is quantitatively or qualitatively inadequate to permit absorption of the vitamin from the gut (78). There is evidence to indicate that this hypoprothrombinemia may be eliminated by the administration of Vitamin K concentrates or synthetic Vitamin K substitutes to the newborn infant (71, 75, 76, 77, 78, 81, 82), or to the mother before delivery (73, 76, 77, 78, 80, 81, 82). The suggestion was soon made that this hypoprothrombinemia was the immediate cause of hemorrhagic disease of the newborn (71-74, 77, 79). A number of investigators observed prolonged prothrombin times in hemorrhagic disease of the newborn, icterus gravis neonatorum, anemia neonatorum, and hydrops congenitus (71, 74, 76, 78, 83). In 1939, Nygaard (71) reported 3 cases of hemorrhagic disease which responded promptly to Vitamin K therapy. Dam (74) reported a similar case. More recently, Poncher and Kato (83) have reported a series of 22 cases of hemorrhagic disease of the newborn successfully treated with synthetic Vitamin K preparations. The infants in these cases all showed active bleeding and prolonged prothrombin time before treatment. In most cases, the prothrombin time was shortened within from two to six hours after Vitamin K therapy and clinical improvement was prompt and permanent. No blood transfusions were given.

Vitamin K therapy appears to be indicated in all surgical procedures on the newborn and in the hypoprothrombinemia associated with hemorrhagic disease of the newborn, intracranial hemorrhage, icterus gravis, anemia neonatorum, and hydrops congenitus (73, 78). Some believe that the administration of Vitamin K to the mother before delivery will effectively reduce the incidence and severity of intracranial hemorrhage in the newborn (73, 76, 78).

4 *Other causes of vitamin K deficiency in man*
It has been shown (84, 85) that the hemorrhagic tendency seen in some cases of sprue is due to K-avitaminosis. A hypoprothrombinemia which responded to Vitamin K has been observed in various intestinal disorders including sprue, intestinal polyposis, ulcerative colitis, intestinal fistula, postoperative gastric retention, gastrocolic fistula, and intestinal obstruction (85). Recently 57 cases of hypoprothrombinemia in the absence of jaundice or evidence of advanced hepatic disease have been reported (86). Included in this series were examples of tropical sprue, ulcerative colitis, regional enteritis, and many other conditions. In some cases, correction of a defective diet alone seemed to correct the deficiency. A Vitamin K deficiency has been reported in a case of cholecystitis in the absence of jaundice or hepatitis (87). It has been suggested that Vitamin K may control the hemorrhagic tendency in certain cases of hypertension and uremia (88), but insufficient evidence is available.

Synthetic substances which have been used clinically in the treatment of Vitamin K deficiencies
A number of clinical reports describing the use of various synthetic Vitamin K preparations are now available. Most of the recent work has been directed toward the search for water-soluble substances suitable for parenteral use. Such preparations would be of value particularly in patients with nausea and vomiting (so often seen in biliary-tract disease) who are unable to tolerate oral medication.

The first synthetic product to be employed parenterally in the clinic was phthiocol. This substance was given intravenously, a large volume of a dilute solution being used, and favorable results were obtained (89-91). Synthetic Vitamin K₁, although practically insoluble in water, has been given intravenously with success in the form of a colloidal suspension in glucose (92). Although 2-methyl-1, 4-naphthoquinone is soluble only to the extent of 1 mgm in 10 ccm of water, it is active in such small quantities that for practical purposes it can be considered water soluble. It has been used intravenously (93, 104), as has its bisulfite addition compound which is water soluble (93). Two-methyl-1, 4-naphthoquinone dissolved in corn oil has been successfully used intramuscularly in doses of from 2 to 10 mgm (94, 95). Two new water-soluble substances have recently been employed clinically. Butt, Snell, and Osterberg (93) gave 1, 4-dihydroxy-2-methyl-3-naphthaldehyde intravenously to 10 patients and obtained a favorable response in all but 2 cases, the latter

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3. *Maternal K deficiency in the newborn.* In 1937 Brinkhous, Smith, and Warner (68) reported that the prolonged clotting time which

showing evidence of severe liver damage. Aggeler Lucia and Goldman (91) and Brown (96) used 4-amino-2-methylnaphthol hydrochloride (K₄) intravenously in doses of from 5 to 30 mgm. with favorable results.

In addition to these preparations, a number of water-soluble synthetic compounds have been shown to possess anti-hemorrhagic activity by animal assays, but up to the present time they have not been tested clinically. Included among these are

- 2-methyl-1-4-naphthohydroquinone (97)
- 2-methyl-1-4-naphthohydroquinone monosuccinate (98)
- 4-amino-3-methyl-1-naphthol (98, 99)
- 2-methyl-1-4-naphthohydroquinone (100, 101)
- Na 2-methyl-1-4-naphthohydroquinone diphosphate (100, 102, 3)
- Na 2-methyl-1-4-naphthohydroquinone disulfate (100, 102)
- K 2-methyl-1-4-naphthohydroquinone disulfate (98)
- 2-methyl-1-4-naphthalene diorydic acid (100)

As might be expected, it has been shown (1, 5) that bile salts are not necessary for the absorption of water-soluble Vitamin K preparations from the gut.

Relative potencies of some Vitamin K preparations. Two-methyl-1-4-naphthoquinone is from 500 (106) to 4,000 (107) times as potent as phthiocol. Although earlier reports were contradictory it is now generally agreed that 2-methyl-1-4-naphthoquinone is more active than either natural or synthetic Vitamin K. The relative potencies reported by various authors vary from 2 or 3 to 1 (108-109) to 30 to 1 (110). The activity of the water-soluble hydrochlorides of 4-amino-2-methyl-1-naphthol and 4-amino-3-methyl-1-naphthol compares favorably with that of methyl-naphthoquinone (99).

Toxicity clinical observations. No toxic reactions were noted from the intravenous injection of phthiocol in doses as large as 300 mgm. (80-91). Ten milligrams of synthetic Vitamin K₄ given intravenously produced no toxic effects (9). No evidence of toxicity has been observed from 2-methyl-1-4-naphthoquinone given orally (intramuscularly) or intravenously in doses up to 16 mgm. (94, 91, 11, 93, 113). Large quantities of 2-methyl-1-4-naphthoquinone (80 mgm.) given orally produced vomiting and porphyrinuria (15). This is an enormous dose however and for practical clinical purposes the toxicity of this substance is not a problem, since from

2 to 10 mgm. is entirely sufficient for an adult dose.

Experimental studies. Thirty milligrams per kilo of 2-methyl-1-4-naphthoquinone given intramuscularly to dogs produced vomiting, albuminuria and porphyrinuria (95). A transient albuminuria was produced by 60 mgm. per kilo of 2-methyl-1-4-naphthoquinone diacetate. These dosages are many times greater than the therapeutic dose. Molitor and Robinson (114) studied the toxicities of phthiocol, Vitamin K and 2-methyl-1-4-naphthoquinone in mice, rats, and chicks. Phthiocol was the most toxic, while Vitamin K produced no toxic effects. The oral lethal dose in mice was 200 mgm./kilo for phthiocol and 500 mgm./kilo for the methyl-naphthoquinone. In chronic experiments, 300 mgm./kilo/day of phthiocol, or 500 mgm./kilo/day of the methyl-naphthoquinone produced some fall in the red blood count and hemoglobin of rats. It is to be noted that these doses are extremely high. A low toxicity for 1 transdiol in methyl-1-4-naphthoquinone diphosphoric ester has been reported by Foster (16) and confirmed by Smith and Ivy (117).

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Jentzer. A. Skull Injuries Caused by Projectiles and Cranio-cerebral Wounds. (Durch Projektilverursachte Schädelverletzungen und Kranio-cerebrale Wunden) *Schweiz. med. W. Anzeig.* 1940, 64, 1.

In the present war there are fewer skull and brain injuries than there were during the World War because in all armies every soldier without exception must wear a steel helmet. During the World War the mortality of skull injuries was 45 per cent. The treatment of brain injuries is carried out today with much greater success than in previous wars. The experiences of neurosurgery have exerted a very favorable influence upon the treatment of fresh skull and brain injuries. All persons with skull and brain injuries, without exception, should be transported as soon as possible to military hospitals. Cases of intracranial hematoma should, on the strength of the well-known symptoms (free interval, unilateral mydriasis, neurological signs, spontaneous exophthalmos threatening aggravation of the general condition, external injury of the hairy portion of the scalp) be trephined early in accordance with the severity of the condition cranial injuries can be brought to base hospitals 15th from twelve to twenty-four hours for surgical aid. Vincent emphasizes rightly that skull injury can be safely operated upon during the first twenty-four hours when the patient is still in very good condition with good chances of success, in contradistinction to perforating injuries of the abdomen. Even though the brain tissue offers the greatest resistance to the entrance of infection, nevertheless, all skull injuries should be brought to operation as early as possible. Splinters of shrapnel or hand grenades should be removed as early as possible from the brain through which sooner the penetrating bullets of the infantry. Of course the prognosis is much more favorable if the operation can be undertaken in specially prepared surgical aid hospital.

The transport situation is such in modern armies that the injured can be brought to surgical operating room either by motor ambulance or flying ambulance within a short time. In general the surgical aid centers are from 20 to 35 km. behind the front. Of 850 injured about 753 are brought by ambulance to the base hospitals during the first eighteen hours. Skull hematomas, subdural hematomas, and middle meningeal hemorrhages are referred to the surgical ambulances for treatment. The surgical ambulances of the army are definite new aid in the medical section of this army. The surgical field hospital, made possible by the surgical ambulance mobile hospital equipped with all the

modern requirements of surgical clinic. The activity of the surgical ambulance is variable according to the type of war (either mobile warfare or entrenchment). It will however be possible to set up the field hospital 5 km. behind the front lines. Skull and brain injuries should be dressed in the first aid stations or on the field with a sterile dressing.

A classification of the head injuries is made. 1. general, cranio-cerebral wounds are divided into the following categories: (1) extensive injury of the scalp (2) penetrating injury of the skull with small external injury (3) oblique injuries of the skull without dural involvement but which are often accompanied with subdural hematomas and extensive injury of the brain substance. The oblique injuries are usually extensive injuries as the projectile makes its way in distant areas of the skull.

At the first aid station the head injury should be cleaned according to all the skill known to medicine. At the wound a tablet of mercurchrome or sulfanilamide should be placed. After that the wound should be closed with occlusion bandage. In this condition the patient is placed in the surgical ambulance or brought into military hospital. The thorax considers the disinfection of the head wound as extremely important, as the late onset of infectious encephalitis is the most severe complication that can occur after head injuries. The greatest number of head injuries during the war of 1914 ended fatally from one or the other of these complications.

The surgical ambulance takes care immediately of the severe hemorrhages from head wounds, combats the shock, extracts large foreign bodies, and gives transfusions. Stopping of hemorrhage and the treatment of shock follow definite surgical principles. Of special emphasis is the administration of from 1 to 20 gm. of sodium bicarbonate to prevent acidosis. To relieve intracranial pressure 5 per cent magnesium sulfate solutions are given and solutions of chloral and bromide.

The thorax discusses the function of the brain in great detail. It follows the technique practiced universally. All the armies, the principles of which have been laid down by Vincent, Cushing, Gail, Laue, Garcon and others. His method of wound treatment outlined follows.

Cleaning of the entrance and exit openings of the projectile.

Removal of all bone splinters in the wound and débridement of all damaged soft tissues.

3. Actual treatment of the brain injury. This attempts to prevent infection and to ameliorate the existing brain symptoms. Blood clot and other fluids are removed with the suction pump. The

brain wound is irrigated with hydrogen peroxide or Dakin's solution

4 Hemostasis is painstaking After thorough cleansing of the wound mercurochrome or sulfanilamide tablets are inserted Tincture of iodine and alcohol should not be employed

5 The dura is sutured with a fine needle together with the periosteum

6 The scalp is sutured in the usual manner Whether the wound should be closed primarily or drained depends upon the severity of the injury Definite statements or rules cannot be laid down for this

Regarding trephining for hematoma the author believes that the ambulance personnel should do this also This is recommended especially in those cases in which the entrance wound of the projectile is small In these cases a severe hematoma may develop with extreme compression symptoms The surgical ambulances are therefore equipped with trephining apparatus

The removal of superficial foreign bodies should not be attempted by the surgical ambulance personnel as they are not equipped with the necessary diagnostic aids Blood transfusions in the combating of shock are advised in amounts of from 100 to 150 ccm, but contraindicated in severe skull injuries The neurosurgical treatment is not given in the ambulances but should be done by specialists in the stable base hospitals

The author gives a review of the necessary instruments and equipment for brain surgery

(SCHWEIZER) LEO A JUHNKE, M D

Brofeldt, S A Skull Fractures and Their Management (Ueber die Schaedelbrueche und ihre Behandlung) *Acta Soc med Fennicae Duodecim*, 1940, Ser B, 28 Fasc 1

At the Finnish Red Cross hospital from 1932 to 1938, the author had occasion to study 1,076 cases of craniocerebral injuries, among which were 275 skull fractures They represented injuries from all sorts of sources—sports, everyday life, industrial accidents, and automobile accidents Sixty five of the patients with skull fracture (23 per cent) died of brain injury, 60 per cent of the deaths occurring in the first twenty-four hours Seventeen patients developed meningitis

Open fractures with access to the brain were opened still further surgically, depressed bone was elevated or removed, the dura was sutured, and the scalp was closed in its anatomical layers Drainage was not instituted Severe frontal fractures usually require only conservative treatment, for the outer wall of the frontal sinus may be the only bone which is fractured, and frequently even though there is a large hematoma the actual bone injury may be slight However, if the frontal sinuses were depressed and the posterior sinus wall was fractured with an exposure of the cerebrum to the sinus cavity, then the sinus was opened widely through the original skin wound, the posterior wall explored, the dura

freed and repaired if necessary, and free drainage established from the sinus out through the wound in the skin

Fractures into the middle cranial fossa are frequently attended by two principal complications meningitis and damage to the auditory apparatus The early diagnosis of such a meningitis may be very difficult, and frequent cerebrospinal-fluid analyses are necessary The organism is usually a pneumococcus or a streptococcus The use of prophylactic serum in patients with potential meningitis has been found to give "good statistical results"

JOHN MARTIN, M D

Gaus, W Therapy in Acute Osteomyelitis of the Frontal Bone (Ein Beitrag zur Therapie der akuten Osteomyelitis des Stirnbeines) *Arch f Ohren, Nasen u Kehlkopf*, 1940, 147 353

Suppurative inflammation of the flat cranial bones is particularly dangerous because of the relationship to the cranial cavity In view of the continuous progress of the illness, radical treatment is necessary Delayed or semi delayed treatment as well as x-ray therapy, though effective in isolated instances, is insufficient for the majority of cases The most radical operation appears entirely justified in view of the fact that new bone formation takes place rapidly, particularly in young individuals However, it seems desirable to save as much bone as possible, and, if there is no extension of the infection into the cranial cavity, to restrict oneself to decorication, or the removal of the outer layer For safety's sake the hard cerebral membrane should be laid open in several places If it shows pathological change, the inner layer should be removed also The question of possible disfigurement should be secondary in consideration Coronal section is recommended

Gaus reports 3 cases of suppurative inflammation of the frontal bone In 2 instances the patients were children, a girl eight years of age and a boy five years old The former was brought to the clinic for treatment after a three day illness, in a state of stupor and with a swelling over the left orbit The eye itself showed no pathological changes

The immediate surgical intervention, consisting of a section across the eyebrow, disclosed a focus of pus in the outer portion of the orbit, moreover, an open fistula was seen at the base of the cranial cavity, and this was cleaned out from underneath On the following day the general condition of the patient was worse and there was evidence of a pasty swelling reaching from the middle of the forehead to the temple It was necessary to expose the frontal bone more thoroughly by a section reaching medially to the sutura coronalis, and by another transverse section reaching to the upper edge of the ear Under the osseous membrane a few suppurative foci were found, the diploe showed numerous foci of suppuration, and the same condition prevailed on the hard cerebral membrane, it was necessary to remove the entire bone together with the margin of the orbit

sutures were applied. The child recovered quite rapidly. The subsequent considerable shrinkage of the flap made a plastic operation necessary which was rendered difficult on account of the former having grown to the hard cerebral membrane.

In the case of the boy swelling on the upper right eyelid appeared eight days before hospitalization. The swelling spread to the left eye. In the course of the following days, a puffy swelling appeared within the radius of the left side of the forehead and the skin took on a blue-red coloring; there was high temperature and the patient became unconscious. The frontal bone was exposed by a bilateral section which reached across the eyebrows and was joined by a transverse section across the radix nasi. Since during the process of exposure numerous foci were discovered in the intermediary layer but the inner bone surface and the exposed portions of the hard cerebral membrane were unaffected, the operation was restricted to debridement and the wound surface was filled with gauze strips saturated with cod-liver-oil salve. After 12 days the boy was fully conscious. Recovery as somewhat delayed by the appearance of an ulceration on the child's back. A considerable shrinkage of the flap made plastic operation necessary.

The third case was that of a twenty-four year-old woman who complained of pain starting at the root of the nose and extending over the forehead to the back of the head; the pain had increased steadily over a period of one year and had become unbearable during the last two weeks before admission to the clinic. There was a swelling at the right and left side of the root of the nose which extended to the hair line and over the right parietal bone. A roentgenogram disclosed a shadow in the right frontal cavity and lighter areas in the frontal and parietal bone. The frontal cavity was exposed by section across the eyebrows; pus was removed and the thickened membrane cleaned out. The cranial corticum was dissected by section reaching from ear to ear. Again the removal of the outer layer and cleaning of the middle layer were sufficient, but recovery was retarded by thrombosis of the pelvic veins. Postoperative treatment consisted of the use of gauze strips saturated with "augustolan" which were placed in the wound cavity through the opening in the eyebrow. Suturing with large quantities of salve in the wound appears too dangerous because of the proximity to the brain.

(Wien) ERICH H. WELLMER.

endotheliomas. The age incidence seems to be much the same as with malignant tumors found in other locations; the growth most often occurring in the middle decades of life but not necessarily so. For some obscure reason as yet unknown primary malignant tumors of the ear are very slow to metastasize even the regional lymph nodes escaping until late in the disease and intracranial extension being the rule.

Nothing pathognomonic can be attached to the early signs and symptoms of these tumors. The malignant disease may in the beginning mimic or supervene on a number of relatively innocent lesions involving those structures associated with the middle-ear cleft and the more serious diseases of the mastoid and petrous portions of the temporal bone. Suspicion should be aroused by one or more of the following clinical phenomena:

1. The presence of tough, resistant granulations or polyps and the rapid recurrence of these when removed by curettage or chemical means.

2. The appearance of bloody discharge at the external meatus sometimes spontaneous and at other times preceded by purulent otorrhea.

3. A complaint of persistent, deep-seated, intractable pain about the ear—severe otalgia not explained by any visible pathological change in the tympanum, the posterior group of paranasal sinuses, the nasopharynx, the teeth, or the larynx.

4. The occurrence of supposedly commonplace lesions of the external or middle ear which not only becomes refractory to treatment but show in its reasonable advance baffling dissimilarity to the usual clinical course and finally produces complications inconsistent as to time and place. A biopsy is the surest way of settling the issue provided, of course, that gross material exists from which specimens may be taken during the early stages. It must be remembered, however, that histological diagnosis is subject to error; therefore it will be necessary to consult the services of competent neurologist or internist as the case may demand.

There is no uniformity of opinion or technique as regards treatment nor can there be since the disease so complex in its ramifications precludes standardization. According to the best modern authorities, treatment consists of combination of several methods now in use. Careless scalation should be made preferably with the diathermy knife and all soft-tissue excision should be done with suitable electrode. Properly the tumor which remains on and is to be removed.

favor. At the conclusion of the operation radium capsules are inserted into the depths of the radical cavity and radium needles implanted subcutaneously around the external ear. Postoperative high-voltage roentgen therapy also is generally recommended.

The author reports a primary malignant tumor of the temporal bone in a woman aged sixty-three.

JOSEPH K. NURVE, M.D.

James, R. M. The Treatment of Tumors of the Salivary Glands by Radical Excision. *Canadian M. Ass. J.*, 1940, 43: 554.

The enucleation of parotid, benign, mixed tumors by the usual technique must be regarded as unsatisfactory, since recurrences varying from 15 to 45 per cent have been reported by different observers. Recurrence is variously reported to be due to failure to excise the tumor tissue and its capsule completely, chiefly from fear of injury to the facial nerve, and perhaps fear of development of a salivary fistula. The reported injuries to the facial nerve vary from 4.4 to 16.9 per cent in benign cases, and from 20 to 36.6 per cent in malignant cases. The author points out that if gland tissue is left distal to a divided main salivary duct, a fistula will occur.

Four main theories of the origin of parotid tumors are mentioned: (1) endothelial origin, (2) embryonal origin, (3) branchial origin, and (4) purely epithelial origin from the gland epithelium itself. No single theory explains their origin, according to Ewing. Some authors believe that benign mixed tumors are capable of forming metastases. At any rate, they are likely to recur locally, and if they metastasize they are usually regarded as malignant mixed tumors.

The author developed a method of excision of these tumors, unaware that Sistrunk and Adson had reported a similar method. The incision is the same. His method differs in that he exposes the facial nerve at the stylomastoid foramen before dissecting the tumor free from its attachments, instead of first exposing and tracing the inframandibular branch proximally to the main trunk. The latter method is more difficult, and in Sistrunk's hands resulted in several partial or complete permanent facial paralyses.

The incision in small tumors begins over the base of the mastoid process close to the ear, and is carried downward and forward behind the angle of the jaw for about 3 in. In large tumors, a second incision begins just in front of the pinna of the ear and is carried down to meet the first incision below the ear. The angle of the junction is made obtuse to prevent sloughing of the tip of skin. This incision can be carried downward and forward to permit exposure and ligation of the external carotid artery as a preliminary step in large or malignant tumors. This step reduces bleeding and makes the dissection of the nerve branches easier.

The incision is deepened to expose the tip of the mastoid process and the origin of the digastric mus-

cle. Removal of the tip of the mastoid process often gives easier access to the facial nerve. The tumor is then dissected free from the branches of the nerve as far as possible. In many cases it is necessary to sacrifice all of the divisions except the temporal branch. It is important to save this branch particularly, since it supplies the eye and upper part of the face. Perhaps the only indication for rapid frozen section of tumors which are removable technically is to determine the necessity for complete sacrifice of the facial nerve.

The results of surgery on malignant parotid tumors, from published reports, appear to be unsatisfactory. These tumors should receive pre-operative and postoperative irradiation, and should be radically removed wide of all malignant tissue. Benign mixed tumors are highly radioresistant, and more radical operative procedure is necessary to prevent recurrence.

The author reviews 48 cases appearing in the records of the Toronto General Hospital over a period of ten years, from 1930 to 1940, including 38 benign mixed tumors, 1 chronic inflammatory lesion, and 9 malignant growths. In 12 of the cases the tumor was excised radically according to the technique described, 2 total excisions of the parotid gland being included, in 5 cases paralysis of the mandibular division resulted.

The author concluded that total excision of the parotid gland can be performed without serious injury to the facial nerve.

JOHN E. KIRKPATRICK, M.D.

EYE

Ferree, C. E., and Rand, G. Pilot Fitness, a Safety Factor in Aviation. *Brit. J. Ophthalm.*, 1940, 24: 581.

The authors devised an instrument which measures the speed of adjustment of the eyes for change of distance, the speed of accommodation, and the speed of adaptation, and also tests ocular and general fatigue. This instrument is called an electrical multiple exposure tachistoscope, and consists of two near and one far test objects which can be subjected to various positions, time factors, and strengths of illuminations. The instrument is readily portable.

The following practical uses of the instrument and test procedure are discussed: (1) a test of vocational fitness in all cases in which dynamic speed of vision is important with either the oculomotor or the accommodative feature emphasized, (2) a test of pilot fitness for aviation, (3) a specific performance test of fitness for night flying, (4) a test of disturbance in fitness due to altitude, (5) a definite limiting test for age as a factor in fitness, (6) a means of measuring ocular fatigue and recovery, and of testing individual susceptibility to fatigue and capacity to recovery, and (7) a means of training eyes to greater oculomotor and accommodative facility.

The authors particularly emphasize the importance of determining pilot fitness before each flight. They make the pertinent observation that

Although check is made on each plane to see that it is in perfect condition before flight little attention is given to the condition of the pilot to see if some temporary disturbance might be present which renders the aviator unfit. Various factors, such as fatigue, loss of sleep, worry and temporary illness, may be of sufficient effect to cause the pilot to falter at critical time. By means of tachistoscope examination requiring perhaps ten minutes these temporary defects can be detected and protection of the plane and its occupants can be afforded.

LUTHER H. WOOLY, M.D.

Gifford, B. R. Tendon Transplantation for Paralysis of the External Rectus Muscle; A Further Report. *Arch. Ophth.* 94, 24, 9-16.

The author says experience with paralysis of the external rectus muscle has led him to the following conclusions:

1. The transplantation of living tendon slips from the superior and inferior rectus muscles offers the best chance of a cosmetic and functional result in paralysis of the external rectus muscle. The outer halves of the muscles were chosen in these cases and the results, on the whole, were satisfactory.

2. Operation should, as a rule, be accompanied by recession of the internal rectus muscle. In cases with primary deviation of more than 3 degrees recession of 3 mm. is usually safe.

3. Overeffects are rare and can usually be overcome by replacing the internal rectus muscle.

4. Tenotomy of the internal rectus muscle should be reserved for cases in which there is marked contracture of that muscle.

5. A vertical imbalance or deviation occurred as a result of the operation.

6. The operation should be performed before secondary contracture has occurred. In cases of acquired paralysis if no improvement has occurred after three to six months of observation, and especially if the paralysis is increased, operation is indicated. In cases of congenital paralysis it may be safely performed between the ages of three and five years.

7. In answer to Bleischowsky criticism, it may be stated that all the patients except have useful

field of binocular fixation while holding the head straight and do not hold the head in an abnormal position.

LAMAR L. MCCOY, M.D.

Davidson, M. The Evolution of Lens Lesions in Ey Perforations and Ruptures. (*Am. J. Ophth.* 94, 3, 358).

A survey of 62 lens lesions, primarily opacities observed in cases of eye perforations by intra-ocular foreign bodies and in eye ruptures without retention of the foreign body indicates that the majority are the result of lens contusion and morphologically belong to the type of contusion lens opacities previously studied. Posterior feathery star-shaped opacities are evidently rare.

Capsule perforation, lens penetration or its double perforation occur in less than a third of the cases that do not lead to immediate cataract.

The retrospective diagnosis of the eye perforation or rupture origin of a lens opacity is sometimes made difficult because of the eventual blurring of the perforation or rupture character of a corneal scar after many years and particularly because of the difficulty in diagnosing an older partial lamellae and scleral perforation or rupture.

The rate of recession into the depth of the lens of originally subcapsular opacities I found to vary in this study just as in the study of pure contusion lens opacities. The factors affecting the rate seem to be capsule lesions which tend to retard it, varying depth of lens penetration which could tend to accelerate it, hypertension and siderosis, which tend to retard it, and hypotension, which favors it.

As to the evolution of the lens lesion in this mild variety of cases, the end-results are satisfactory in the majority of cases, but prognosis should be more guarded in the individual after he is thirty years old. Deterioration should be watched for in the fifth decade when apparently most deteriorations occur.

LAMAR L. MCCOY, M.D.

Weinberger, L. M. and Webster, J. E. Visual-Field Defects Associated with Cerebellar Tumors. *Arch. Ophth.* 94, 3, 5.

For the purposes of focal neurological diagnosis, it is generally accepted that defects in the visual field indicate direct involvement of the visual path at some point. This is thought to be so true and so dependable that intracranial operations are often planned and performed solely on the information obtained by examination of the visual fields. The great value of perimetric examination has been repeatedly stressed by neurological and ophthalmological writers.

Little, however, has been attention on the false clues occasionally furnished by visual field defects, or that it more precisely by the field defects resulting from the effects of distant lesions on the visual path.

Although it is generally believed that field defects indicate direct involvement of the optic path as the responsible lesions and that a visual field de-

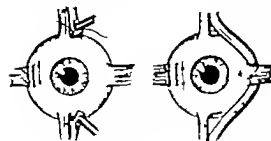


Fig. Technique of tendon transplantation with recession of the internal rectus muscle.

fects therefore point to the location of the lesion, 8 cases are cited in which various combinations of field defects existed, because of verified cerebellar tumors. In 4 cases there were homonymous defects, in 2 these were homonymous hemianopsias. In 1 there was a bitemporal defect, and in 4 there were various combinations of visual-field defects loosely classified as "atypical." In all but 1 case the diagnosis was confused by these findings and ventriculographic studies were relied on to clarify the diagnosis. In the cases in which ventriculograms were made or autopsy was performed, a marked degree of ventricular distention was found. The third ventricle shared in the general dilatation of the ventricular system.

Though cerebellar tumors are thought not to produce field defects, it has been recognized by many writers that such defects may occur with internal hydrocephalus. Yet every cerebellar tumor eventually results in hydrocephalus. The clinical evidence in the authors' cases also suggests that the distention of the third ventricle resulting from cerebellar tumors is the primary cause for the field defects reported in their 8 cases. While direct compression of the optic chiasm may give rise to bitemporal hemianopsia, the other defects, such as binasal hemianopsia, homonymous hemianopsia, and various unclassified defects, probably depend on notching of the optic nerves and chiasm by the adjacent arteries plus the fact that the chiasm is not always in direct vertical relation with the third ventricle. Thus, many and varied combinations of visual-field defects may follow dilatation of the third ventricle. As a corollary point, the presence of a visual-field defect does not exclude the presence of a cerebellar tumor.

LESLIE L. MCCOY, M D

NOSE AND SINUSES

Converse, J M. Corrective Surgery of the Nasal Tip. *Ann Otol, Rhinol & Laryngol*, 1940, 49: 895

During recent years plastic surgery of the external nose has been greatly improved. This is true particularly of corrective operations upon the nasal bones, the lateral cartilages, and the septum. Surgical correction of the tip of the nose is more difficult. It is, however, essential, for deformities of the nasal tip are the most conspicuous of all nasal deformities.

The tip of the nose is constituted by a cartilaginous framework, the alar cartilages, supported by a central pillar, the septum. In the midline the two cartilages meet, supported by the anterior-superior angle of the quadrangular septal cartilage. The alar cartilages then present a sharp turn downward to form the columella. The cartilaginous framework is lined on its inner surface by mucous membrane. It is covered on its outer surface by muscles, subcutaneous tissue, and skin. The muscles which cover the alar cartilages and are inserted upon them are muscles of expression, the nerve supply of which is derived from the facial nerve. Their actions produce dilatation or constriction of the alae and elevation or depression of the tip.

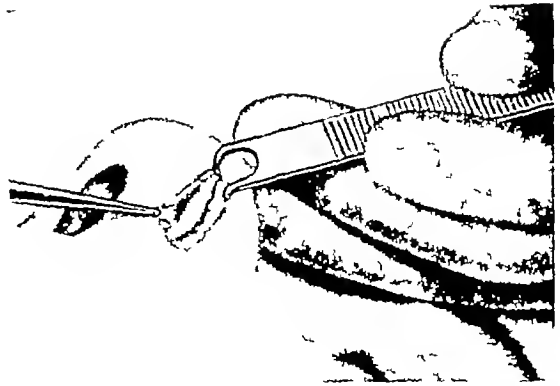


Fig 1

The shape of the alar cartilages is extremely variable. The variations observed in over 100 operations for tip corrections apply to both the size and the shape of the alar cartilages. Patients with wide hypertrophic tips present thicker alar cartilages than those having thin tips with collapsing alae. The alar cartilages extend farther laterally into the alae in the thin type of nose than in the broad type. At times there is a generalized hypertrophy of the alar cartilages in every direction which gives a large bulbous tip.

A surgical approach to the nasal tip must present two essentials: adequate exposure of the cartilages and preservation of the physiology of the region. Adequate exposure of the nasal tip can be obtained by two methods: tip exposure "from above," and tip exposure "from below." In the first method, complete subperichondrial dissection of each alar cartilage is carried out after the exposure of the lower border of the cartilage through an incision near the free border of the nostril. This incision is made along the full length of the cartilage and is carried medially following the curve of the cartilage down the columella in front of the anterior border of the septum. The whole of the cartilaginous tip may then be drawn out through one side or the other.

In the second method, an incision about 1 cm in length is made along the anterior border of the alar cartilage. A second incision is made along the superior border of the alar cartilage just below the inferior border of the lateral cartilage. The mucous membrane lining the alar cartilage is then elevated along the whole surface of the alar cartilage as far laterally as its free lateral border. A subperichondrial elevation of the muscle layer is performed so that the cartilage is completely separated. The alar cartilage can be seized with a fine hook and drawn out through the vestibular incision.

The author also discusses corrective surgical methods for increase in transverse dimensions, increase in the vertical dimensions of the nasal tip, and deviations of the nasal tip.

NOAH D. FABRICANT, M D

Malbec, E. F. Fourteen Cases of Partial Rhinoplasty. *Marble Prostheses* (Consideraciones sobre casos de rinoplastias parciales. Prótesis de marfil). *Seminario médico* 940, 47 71.

Fourteen cases of partial rhinoplasty are described in which the author used marble prostheses. There are various deformities of the nose, some of them being cases of extreme saddle nose. Photographs of the patients before and after the operation are given, showing the excellent results of the method, the technique of which is described briefly. In 11 of the cases, or 78.57 per cent, the results were entirely successful, while there was failure in 3 cases or 21.43 per cent.

There has been a great deal of discussion as to whether living or dead material is to be preferred in such operations. On the basis of his experience the author believes that dead material, such as ivory, is to be preferred. His marble prostheses have been tolerated perfectly. Once they have become adapted to the soft tissues around them they do not change in shape, size, or direction. The author notes that his patients, as operated on longer than three years ago, so he cannot say definitely whether the results will be permanent, but he sees no reason for any later change. Eitner has reported cases which he has followed up for twenty-five years without change.

On the other hand, living material such as bone or cartilage, may undergo changes long after the operation by being absorbed or increasing in size with disastrous effects on the cosmetic result. The author's cases include some in which bone prostheses was used first. The deformity recurred and an ivory prosthesis was then inserted. Roentgenograms showed the thin atrophied layer of bone beneath the ivory prosthesis.

ARMSTRONG G. MORRIS, M.D.

MOUTH

Griffith, A. Radium Treatment of More Advanced Forms of Cancer of the Buccal Mucosa. (Il trattamento radioterapico delle forme avanzate del carcinoma della mucosa della guancia). *Radiol. med.* 949, 27 44.

Ferraris, Director of the Radiological Institute of the University of Milan has standardized, for the more recent cases of buccal cancer, treatment in three stages: (1) the primary tumor is attacked by interstitial implantation of radium needles or by radium-bearing applicator molded to the inside of the cheek; (2) the regional lymph nodes are radically extirpated; and (3) the region of the lymph nodes is simultaneously irradiated.

However, the surgeon more frequently has to deal with more advanced tumors. Many patients being smokers or tobacco-chewers, are accustomed to slight sores in the mouth and people of poor intelligence do not even care about more evident symptoms. They neglect the cancer until it has grown across the buccal mucosa into neighboring parts and into deeper layers, even to the outer side of the cheek.

In such cases this scheme of treatment is impracticable or inadvisable: the endoral access to the cancer could be partly impossible; the implantation of radium needles might produce too far-reaching destruction and acute septic processes; and the extirpation of metastases in the regional nodes could be dangerously delayed.

Therefore, a different method has to be employed for this group. It begins with the external application on the cheek and region of the lymph nodes, of radium element packs consisting of 1.5 to 1.5 from 5 to 20 mgm. of radium, with a 1 mm. platinum filter. The whole region has to be equally irradiated, until the epidermical dose is reached everywhere within from ten to fifteen days.

After the first stage of irradiation usually the surface of the tumor gets cleaner and smoother. Gradually the infiltration and the rigidity of the cheek are diminished, and the opening of the mouth and the mastication are facilitated; the enlarged nodes shrink and their mobility improves.

If the recession of the tumor goes on fast enough, endoral radium treatment is then given.

If however the tumor responds only slowly to the transcutaneous irradiation, the second stage of the treatment should consist of the extirpation of the nodes. After that an edema of the cheek may be expected, which may interfere with the opening of the mouth and render indistinct the demarcation of the tumor. However, the edema disappears slowly and the effect of the external irradiation becomes manifest. Now the treatment must be completed by the endoral application of radium.

The author reports on 17 patients with advanced cancer of the cheek. Seven underwent the complete treatment. Four of them proved completely cured after five months, one after six months, and six years, respectively. Two had to undergo supplementary irradiation of small parts of the primary tumor, had no curable recurrences, and are yet under observation. Five patients had only two stages of treatment of these died of cancer and of postoperative complications were cured. Of 5 patients who received only one stage of treatment, three have shown improvement and completion of the cure is expected.

The results of the treatment are very satisfying, when the large extension and the deep infiltration of the tumors in question are considered.

Of course, even this method is not practicable in every case of buccal cancer. Once the tumor has grown too far across the limits of the cheek, has deeply destroyed the jaw bone, or has produced large ulcerations of the skin, if the nodal metastases are too far advanced or if the patient is cachectic, then the same treatment could inflict damage and compromise the method.

VELA CAMERO.

NECK

Gordon-Taylor, G. On Carotid Tumors. *Brit. J. Surg.* 949, 5 63.

Carotid-body tumors occur at ages from six months to seventy-three years but most of the pa-

tients are in the seventh decade. Males are affected in the ratio of 3:2 but in the author's series only 1 of 5 was a female. An injury was recorded in the history of 1 reported case. An aberrant carotid tumor was found at autopsy below the bifurcation in 1 instance. Bilateral tumors are exceptional but have been reported. In some instances a long time interval elapsed between the onset of the 2 tumors. In 1 instance one of the tumors was malignant, the other benign. It appears that 80 per cent of the tumors were benign and that in the reported instances the postoperative recurrence rate was 8.9 per cent.

Examination of the regional lymph glands has shown evidence of infection in some instances. Metastases to the liver and ovary have been recorded. In 1 instance a carotid body tumor was found in a block dissection for buccal carcinoma. While in the recorded cases the average duration of the tumor was twelve years, in the author's 5 cases the duration was a little more than two years. The average size of the author's cases was 3 by 3.5 in in the two axes. The tumor is painless, not tender, moves laterally but not vertically. Pulsation is communicated to the tumor by the adjacent vessels. A systolic murmur may be heard but is not common. Syncope and dyspnea may be produced by pressure. It is reported that the tumor is radiosensitive but in 1 of the author's cases the tumor was radioresistant and proved to be a neurinoma.

In the operative treatment the danger of hemiplegia and death in elderly patients is most significant as a result of the occlusion of the common carotid artery and its branches. The author details 3 cases in which the tumor was accurately dissected away from the vessels. In a fourth case a neurinoma was removed from the vicinity of the bifurcation. In a fifth case death followed excision of the tumor with ligation of the vessels. The author asserts that even when the arteries appear almost imbedded in the growth, meticulous care and painstaking dissection may sometimes reveal a "white line" whereby the continuity of the main arterial vessels may remain undisturbed or at least structurally inviolate.

The vagus, sympathetic, and hypoglossal nerves may be involved and have to be resected. Changes in the larynx follow vagus resection, while pupil and eye changes occur following sympathetic resection.

Resection of the tumor when still small, before encroachment on adjacent structures, will improve the prognosis. Tumors not originating in the carotid gland but located at the bifurcation make accurate preoperative diagnosis not always possible. The part played by afferent nerves from the carotid sinus in the regulation of blood pressure are of no particular surgical significance.

MANUEL LICHTENSTERN, M.D.

Isabel H. Hart, H. J., and Warren S. Carcinoma of the Thyroid. *Ann. Surg.* 1910 112: 97.

The authors present a historical review of cancer of the thyroid and point out the relationship of malig-

nancy to pre-existing adenomas of the thyroid gland. Four illustrative case reports are given, which demonstrate the penalty of delay in the removal of discrete adenomas, and stress the necessity for their early removal as a prophylactic measure.

In the clinical diagnosis of malignancy of the thyroid, thyroiditis must be differentiated. The outstanding feature of this disease is that while the gland may become stony hard, its symmetry and anatomical outline remain in general unchanged. In contradistinction to this, malignancy of the thyroid arises locally with resultant loss of symmetry. Firmness in the palpated lesion occurs only when the disease is well advanced, and the adjacent cervical lymph nodes are usually enlarged. Malignant degeneration of an adenoma of the thyroid is suggested by a gradual painless change in consistency from one of firmness to one of induration (as contrasted to hemorrhage into an adenoma, which occurs rapidly and is associated with pain and tenderness), loss of a sharply defined outline with diffusion of the tumor mass into the parenchyma of the gland, fixation of previously movable tumors to the surrounding structures, and, at the time of operation, firm attachment of the prethyroid muscles to the tumor. Recurrent laryngeal paralysis has but little value as a diagnostic sign. Malignant degeneration may occur in a very small thyroid adenoma, and in young patients.

The potential malignancy of lateral aberrant thyroid masses should be recognized, and when they exist, complete dissection of both sides of the neck together with wide removal of any tumors within the thyroid gland itself, is necessary. These bodies should not be confused with metastatic nodules in the lymph nodes.

The most satisfactory management of thyroid malignancy is by means of a combination of radiation and surgery. Surgery is most satisfactory in the prophylactic removal of benign tumors next to tumors in which the malignancy is intracapsular, next in tumors in which erosion of the capsule has involved the parenchyma at only one point, and last in cases with wide infiltration of the muscle, trachea, and lymph nodes by the growth.

Even in advanced thyroid malignancies, a biopsy specimen should be obtained since the degree of radiosensitivity varies greatly with the different types of thyroid carcinoma. Seemingly hopeless cases have become discrete, movable, and removable after radiation. The type of tumor will determine how much surgery, as well as how much radiation to apply. One should not be any more radical than is necessary, to remove the malignancy completely. If complete surgical removal is impossible, removal may still be attempted in order to leave less to the irradiation to accomplish, and often to relieve respiratory obstruction.

If radical surgical removal or an extensive unilateral carcinoma of the thyroid is attempted the entire lobe of the gland with its contained malignancy and the internal jugular vein and its tri-

laries attached to the sternomastoid muscle, and, if necessary the recurrent nerve must be dissected out. The removal of the internal jugular vein is of great importance because of the fact that thyroid malignancy tends to extend to the veins and along their course. It is unwise to continue attempting to remove malignant thyroids unless the dissections can be carried along definite anatomical lines of cleavage. It is particularly hazardous to attempt to remove mediastinal extensions since there is danger of hemorrhage and infection. Damage to an adherent esophagus must be avoided. If the patient's breathing is hampered or if extensive dissections of the trachea have been done, tracheotomy should be performed at the time of operation.

The following pathological grouping of malignant tumors of the thyroid is given, and their histopathology is described and illustrated by photomicrographs. Group I includes tumors of low or potential malignancy: adenomas with blood-vessel invasion and papillary cystadenomas with blood vessel invasion originating from thyroid and aberrant thyroid glands. Group II includes tumors of moderate malignancy: papillary alveolar and Hürthle-cell adenocarcinomas. Group III includes tumors of high malignancy: small-cell carcinomas or carcinoma simplex (compact and diffuse types), giant-cell carcinomas, epidermoid carcinomas, fibrosarcomas, and lymphomas.

The writers believe that every case of thyroid cancer should be given radiation therapy even though the tumor is of low and potential malignancy. If the tumors of moderate and high malignancy most of the good results from radiation come when as much of the tumor has been removed surgically as possible. The end-results depend upon radiation therapy being given in large protracted doses to destroy the tumor completely. Radiation treatment is started usually within one week after the surgical operation and does not interfere with wound healing. A cross-fire method of radiation is preferable, on treatment being given daily to each of three portals, one portal on each side of the neck and one in the midline, and care must be taken not to overlap the fields. A total dose of 6,000 roentgen units is delivered to the skin during one series of treatments. The complications of radiation treatment are radiation sickness, which usually clears within seventy to hours after radiation has been completed, radiation dermatitis, which may require six to eight weeks to heal and laryngitis and tracheitis which disappear in from nine to ten weeks.

In this series of 5 cases of carcinoma of the thyroid, the five-year survival rate following combined radiation and surgical treatment was adenoma with blood vessel invasion, 75 per cent, malignant papillary cystadenoma, 6 per cent, papillary adenocarcinoma, 80 per cent, alveolar adenocarci-

noma, 7 per cent, small cell carcinoma, 3 per cent, giant-cell carcinoma, 17 per cent, and fibrosarcoma, 33 per cent. S. LLOYD TERTULIAN, M.D.

Salinger. R: Radiation Therapy for Carcinoma of the Larynx: Observations After Twenty Years. *Arch. Otolaryngol.* 940, 3: 837.

Salinger's experiences with radiation therapy for carcinoma of the larynx are sufficiently interesting to warrant reading of the original. In brief, however, the author finds evidence in the record that intrinsic lesions do better with irradiation than with laryngostomy or laryngectomy except when certain constitutional conditions exist as definite contraindications to operative treatment. As for extrinsic lesions which are beyond surgical intervention, one would have to determine from the extent of the lesion, the general condition of the patient and the histological picture whether it is worth while to take the risk of full doses of gamma rays in the hope of cure assuming thereby the risk of chondritis, necrosis, and the long convalescent period, or whether it is better to administer moderate amounts of the gamma rays for palliation only. With continued experience and changes in technique it may be possible at some time to be able to carry out treatment through full course of radiation without any danger of adding to his suffering, but to prevent the risk is still there and should not be minimized. As for the borderline lesions, Salinger believes that, since postoperative radiation is tolerated better than postirradiation surgical treatment, the patient should be operated upon provided his general condition is satisfactory and then should be given adequate course of irradiation since the results from irradiation alone are at date not sufficiently impressive to offer the patient any greater hope of cure than is offered by surgical intervention.

Finally the following points are emphasized by the author:

1. A patient should never be subjected to either operation or irradiation without preliminary biopsy. Jackson has treated this over and over.

2. The best results will be obtained only when the laryngologist, the radiotherapist and the pathologist cooperate to the fullest extent, without prejudice.

The patient is entitled to the best that all physicians have to offer and his prognosis is given in particular case should be based on the combined experience of the best observers and applied as closely as possible to the situation under consideration. Under no circumstances should patient be misled by the wishful thinking of his physician, nor should he be permitted to make his decision without full knowledge of what the available therapeutic agents have accomplished in the past.

S. LLOYD TERTULIAN, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Pickles, W Head Injuries *New England J Med*, 1941, 224 139

From an analysis of a series of 554 patients with craniocerebral injury, Pickles concludes that the treatment of such injuries resolves itself essentially into the treatment of injury to the brain. Such injury, varying widely, may be divided clinically into (1) concussion (momentary loss of consciousness, no neurological signs, normal lumbar-puncture findings, 4 per cent), (2) congestion (concussion plus headache, nausea, vertigo, vomiting, confusion, loss of memory, normal cerebrospinal fluid under increased pressure, 47 per cent), (3) contusion (congestion plus gross injury of the brain of varying degrees, producing shock, convulsions, delirium, shifting signs of localization, and a bloody cerebrospinal fluid under increased pressure, 49 per cent).

Treatment consists of such measures as will abolish shock and restore a normal intracranial pressure. Scalp wounds are given careful surgical cleansing and repair. Depressed, comminuted fractures require a prolonged and careful toilet with meticulous débridement and generous irrigation with warm saline solution. Extradural and subdural hematomas also require early surgical care, the author's treatment being the standard one in such cases. Drugs are used sparingly, morphine not at all. Lumbar punctures may be done carefully and repeatedly, as often as every six hours if need be, until the cerebrospinal fluid is clear. Intravenous dehydrating agents are used in moderation. Subtemporal decompression is rarely resorted to.

The author's operative incidence is 6 per cent, his operative mortality is 29 per cent and his gross mortality is something less than 5 per cent.

JOHN MARTIN, M.D.

Eckhoff, N L Actinomycosis of the Central Nervous System, Report of 2 Cases *Lancet*, 1941, 240 7

Actinomycosis, rare in the central nervous system, may arrive in such location by (1) spread along the perineural sheaths of the olfactory nerves to the region of the olfactory bulbs, (2) spread by way of the blood stream, as from a lung granuloma, to form a metastatic brain abscess or a meningitis, (3) direct spread in the connective tissues of the face and jaws through the various foramina at the base of the skull.

Two cases are reported, the intracranial actinomycotic lesions arising by means of the third named route. Both patients were males and both suffered a primary cervicofacial actinomycosis, one man showed evidence of additional spread of the lesion from an extracranial site through necrotic bone of the cal-

varium. Both patients died of intracranial actinomycotic abscesses. The author suggests the use of chemotherapy when the nature of the infection is diagnosed early.

JOHN MARTIN, M.D.

Piquet, J Roentgen Examination of Brain Abscesses (*L'exploration radiologique des abcès encéphaliques*) *Presse méd*, Par, 1940, 48 1019

The usual method of roentgen examination of brain abscesses is to remove from 2 to 5 c cm of pus and immediately afterward inject the same amount of opaque liquid—lipiodol or 20 per cent iodipin. The advantages of roentgen examination are that the opaque fluid penetrates any extensions or diverticula of the abscess and gives important information in regard to the depth of the abscess and consequently in regard to operation. Very large deep abscesses cannot simply be drained, but require extensive resection of the brain substance.

The injection of opaque substance into the brain, however, is not free of danger. The fragile walls of the abscess may be broken and the ventricle infected. The production of iodism and embolism from the injection of iodipin have also been reported.

The author has a personal method which he thinks obviates the danger. He does not inject the opaque substance immediately after the evacuation of the pus but waits for several days until the formation of connective tissue strengthens the wall so there is little or no danger of rupture. Then, instead of injecting the fluid he inserts into the cavity strips of gauze impregnated with lipiodol. In this way the brain substance with a tendency to herniate into the abscess cavity is pushed back into its normal place. When the principal cavity has been filled in this way a little of the contrast solution flows into the diverticula and outlines them faintly. In this way the approximate size of a secondary cavity can be determined. Forty-eight hours later when the dressing

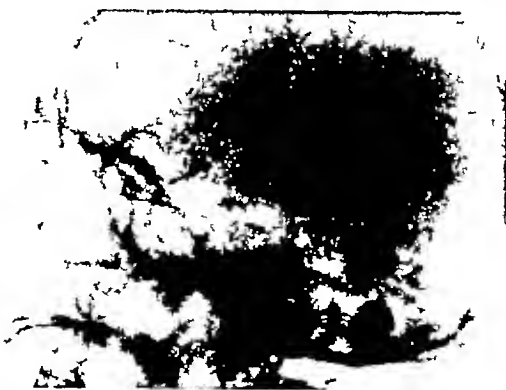


Fig 1 Cerebellar abscess

is changed, the secondary cavity can be packed also and its exact boundaries determined. Figure 1 shows how clearly this method reveals the depth of a cerebellar tumor.

Some writers claim that the injection of opaque substance even furthers cure. The author thinks this is going too far however. Moreover roentgen examination is not indicated in all cases, as for example, in brain abscesses in children in which the encephalitis quickly fills the cavity and the suppuration stops in a few days. Also, roentgen examination may fail in cases in which the secondary cavity is not connected with the first.

The author believes that roentgen examination made at least eight days after the removal of pus, by means of packing the cavity with lipodolized gauze is harmless and may show anatomical details that are valuable in the choice of treatment.

ARTURO G. MORAN, M.D.

Galletto, G. Experimental Studies on Cerebral Arteriography (*Studi sperimentali di arteriografia cerebrale*). *Radiol. med.*, 1940, 27, 905.

Morris in 1917 was the first to use arteriography in studying the cerebral blood vessels. Arteriography is of particular importance to neurosurgery in aiding the localization of brain tumors. There are other practical applications, such as in: (1) neurological diagnosis in cranial injuries (2) studies of circulatory disturbances in the brain and of its collateral circulation in health and disease (3) the study of the cerebral vessels in (4) cranial hypertension in vascular diseases and (5) the study of the velocity of the cerebral circulation. In addition it has been used to study the dynamic cerebral anatomy in contrast to the usual static anatomical studies made at autopsy.

The author performed the present series of studies on the cadaver. He injected thorotrast into the vertebral artery at its origin near the subclavian artery with special pressure apparatus made with a rubber bulb. The subdural spaces and the lateral ventricles were injected by suboccipital puncture and by puncture of the lateral ventricles according to the

technique of Dandy. Likewise the internal and external carotid arteries were injected. After the injections roentgenograms were made in the anterior, posterior, lateral, and submentovertical positions with the use of a Potter Bucky diaphragm.

In the first 3 cadavers the author used 50 per cent sodium iodide. He found that using oil (one internal carotid artery for injection was inadequate). The posterior fossa was best visualized by injecting the internal carotid and the vertebral artery on the same side.

In the second series of cadavers (Nos. 4 to 6) thorotrast was injected under pressure (from 50 to 100 mm.). It was found that injection of the internal carotid and the vertebral arteries on the same side gave the most satisfactory results.

In the third series of cadavers (Nos. 9 to 11) iodipin (Merrick) was used as a contrast medium and subdural as well as lateroventricle injections were performed.

It was found that the thorotrast injections gave better results than iodipin (Fig. 1 (thorotrast) vs. Fig. 2 (iodipin)). The studies also showed the possibility of filling all of the blood vessels in both cerebral hemispheres by the injection of the internal carotid and the vertebral arteries on the same side. The greatest contrast and clarity was obtained with the injection of air into the subdural space (Figs. 2, 3 and 5). Figure 4 represents the first attempt to inject thorotrast contrast medium into the vertebral space in order to demonstrate the cerebral connections. In the fourth series all the submentovertical views were omitted in order to study the vertebral arteries, the basilar trunk, and the circle of Willis (Figs. 5 and 6).

In summarizing the author notes that the sodium iodide tends to diffuse outside of the vessels and obscures the clarity of the films that it is best to inject the internal carotid and the vertebral arteries

on the same side to get the best visualization of the cerebral circulation that thorotrast also tends to diffuse but this tendency is corrected by the addition of gum arabic, and that water injected into the vertebral space aids in the contrast. He also uses emborrator (a less expensive modification of thorotrast).



Fig. 1



Fig. 2



Fig. 3

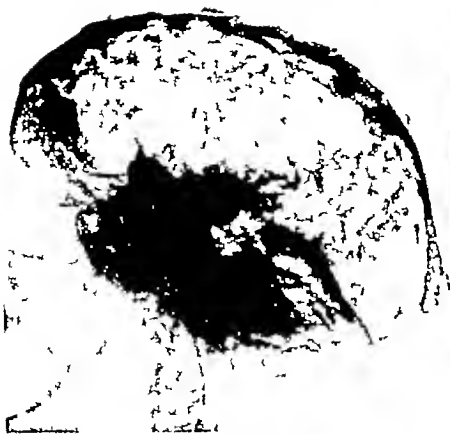


Fig 4



Fig 5



Fig 6

trast) in dilutions of 1 to 3 for injection into the lateral ventricles by the technique of Dandy

JACOB E. KLEIN, M.D.

Weinberger, L. M., Adler, F. H., and Grant, F. C.
Primary Pituitary Adenoma and the Syndrome
of the Cavernous Sinus, A Clinical and Anatomical Study *Arch. Ophth.*, 1940, 24: 1197

Fourteen cases of primary pituitary adenoma are described which presented unusual neurological and neuro-ophthalmological clinical pictures. They were divided into three groups: (1) those in which the disturbances referable to the ocular and trigeminal nerves comprised the exclusive neurological picture, (2) those in which the symptoms referable to the ocular and trigeminal nerves dominated the clinical picture, but in which there were some evidences of implication of the optic chiasm, and (3) those in which the disturbances referable to the ocular and trigeminal nerves were an important part of the clinical symptoms, but in which there were unequivocal visual field defects indicating an intrasellar lesion.

The disturbances referable to the ocular and trigeminal nerves in these cases were accounted for by the implication of the cavernous sinus. It was shown that occasionally pituitary adenomas grow laterally and that this mode of growth may produce the clinical picture of a lesion in the sphenoid fissure rather than the classic chiasmal syndrome.

In addition to the aggregation of signs and symptoms pointing to implication of the structures contained in the cavernous sinus, the cases reported by the authors presented two fairly constant characteristics: (1) evidence of dysendocrinism, and (2) roentgen evidence of an intrasellar lesion.

The anatomical structure of the sella turcica and its surroundings, which results in the lateral growth of the tumors with involvement of the structures contained in the cavernous sinus, is discussed by the authors.

The conditions to be differentiated are: (1) suprasellar tumor, (2) aneurysm of the internal carotid artery, (3) meningioma of the lesser wing of the sphenoid bone, (4) nasopharyngeal carcinoma with extension through the base of the skull, (5) tumor of the gasserian ganglion, (6) sarcoma of the sphenoid bone, (7) orbital tumor, (8) syphilis and syphilitic arachnoiditis, and last, though not least, (9) suppurative sphenoiditis associated with periostitis of the sphenoid fissure.

It is now the generally accepted principle always to approach the pituitary adenoma from the right side when transfrontal craniotomy is performed. This procedure is adopted because it is technically much easier for a right-handed operator to approach from the right. Another consideration is the avoidance of the left-sided speech centers. This is especially important if it becomes necessary to resect the frontal lobe to gain exposure of the tumor. It appears that this justifiable standardization of technique requires amendment in the cases of tumor that present the syndrome of the cavernous sinus on the left side. According to the operative findings in the cases reported here and the necropsy observations, the approach must be from the side presenting the disturbances referable to the ocular and trigeminal nerves if relief is to be obtained. Since these tumors may occupy and infiltrate the cavernous sinus, extreme care must be taken to avoid tearing of the sinus, with resultant uncontrollable hemorrhage.

Radiation seems to have a fairly good effect in relieving symptoms referred to involvement of the nerves contained in the cavernous sinus. If, however, roentgen therapy rather than surgical intervention is used as the initial attack on a pituitary adenoma and it is unsuccessful, the tumor may spread widely and thus make a surgical attack difficult and hopeless if occasion demands it later on.

JOSEPH K. NARAT, M.D.

Jakob, C., Prins, L., Riedel, C., and Théron, J. *Paralyse Spastique Paraplegia by Compression of the Inferior Dorsal Medulla from Dorsal Endothelioma Psammomatosa (Paraplegia dolorosa explicata por compressão da medula dorsal inferior por endothelioma psammatoso dorsal)* *Semana med* 940, 47, 197.

The authors indicate the rarity of the localization of psammoma in the spinal dura mater. For that reason they report in detail a clinical case with suitable illustrations.

The patient was a fifty-three-year-old female with a family history of tendency toward melancholia and kyphoscoliosis in the female half of the family tree. The first symptom of the present illness occurred in 1935 with girdle pains and pains in the right hip. These pains were intermittent in nature and began usually in the mornings. By the beginning of the next year involuntary contractions of the extremities had developed which were much worse at night. In April, 1939, a feeling of coldness had developed in both legs. By October the symptoms had become worse and were spreading to the body. By November there was a sense of constriction about the level of the umbilicus and also some pain. Then a frank paraplegia developed which was worse on the right side. This was painful spastic paraplegia. Then there occurred incontinence of the sphincters. In April, 1940, the patient as bedridden in position of dorsal decubitus. There was persistent constipation with tenesmus and incontinence of the anal and vesical sphincters. Pressure over the eighth, ninth, and tenth dorsal vertebrae caused pain. Active motion was completely gone in the right leg and very much diminished in the left leg. There was diminished tone of the muscles in the postero-external aspect of the legs with trophy of the muscles. There was hypo-excitability of the galvanic and faradic response without reaction of degeneration.

Knee reflexes were exaggerated on both sides; the Achilles reflexes were diminished. The abdominal and femoral reflexes were energetic. Abdominal cutaneous reflexes were abolished on the right side. The Babinski plantar reflexes were positive on both sides. The Gordon, Oppenheim, and Schaeffer reflexes were positive. Plantar reflexes were abolished except in small area on the superior external third of the thigh.

Tactile sensation was normal but pain sensations were preserved (hyperesthesia on the dorsum of both feet). Thermal sensations were diminished below the level of the umbilicus. Thermal anesthesia was present in the femorocutaneous region, and in the dorsum and plantar regions of the feet. In few isolated spots heat caused an intense sensation of cold. There was a loss of deep sensibility.

X-ray studies revealed diminution of size of the eighth, ninth, and tenth vertebral bodies. Ascending lipiodol injection was stopped at the superior border of the tenth vertebra. Lumbar puncture showed increased pressure (13 in the sitting position); the effluent contained 57 per cent polymorphonuclear

leucocytes, the albumin 0.50/100, glucose 0.75 per mill. and the chlorides 7.07 g/100. The Pandy test was positive. The Wassermann and Kahn test were negative. The red blood count was 3,470,000 the white blood count, 11,800 neutrophils, 67 per cent basophils, 0.30 per cent, eosinophils, 1.50 per cent lymphocytes, 5 per cent and the large mononuclears, 3 per cent. The Mantoux test was positive. The general condition was excellent with a slight loss of weight. The diagnosis was spastic paraplegia due to compression of the medulla at the level of the eighth, ninth, and tenth dorsal vertebrae; the Brown-Séquard syndrome.

On April 29, 1940, the patient was surgically treated under cyclopropane anesthesia. A laminectomy of the seventh and the eleventh dorsal vertebrae was performed. The dura mater was under great tension. At the level of the ninth dorsal vertebra the dura mater was considerably reddened and thickened. The dura mater was incised for 6 cm. and a pea-sized tumor was found compressing the medulla. This was excised. An encrusted area with tendency to bleed was found in the dura mater in which the tumor was embedded.

One month after the operation the painful contractions had diminished considerably. The patient slept from five to six hours at night, the girdle sensation as much ameliorated and the sphincter control as normal. The reflexes and sensibility had also markedly improved. Biopsy revealed typical endothelioma with numerous psammomatous bodies. The pathogenesis included the following: (1) primary period—latent endothelial arachnoidal plaque; (2) second period—endothelial proliferation with subdural adhesions; (3) third period—vascularization and transformation into neo-endothelioma; (4) fourth period—the formation of psammomatous bodies. Ten months after operation there was marked improvement; however the patient was still static and walked with the aid of crutches.

JACOB E. KLEIN, M.D.

Schwartz, C. W. *The Crural and Intracranial Epidermoidomas, From Rontgenological Viewpoint.* *Am J Roentgenol* 94, 45, 8.

The epidermoid tumors are relatively benign although on rare occasions they may undergo malignant degeneration.

They are covered by layers simulating the skin of an onion and giving a lustrous pearly sheen. King described three such layers: outer consisting chiefly of areolar connective tissue; middle, composed of stratified squamous epithelium; and an inner formed of cornified epithelium. On the other hand, Bailey found four layers, the stratified squamous granulosum, fibrosum, and ciliatum. The central and major portion of the tumor consists of epithelial debris with cholesterol, from which comes the frequent designation of cholesteroloma.

The epidermoid tumors originate from groups of cells which may be thought of as ectodermal rest. Once started in the embryo they grow on and

but because they produce no symptoms they may reach a considerable size before they are discovered.

The incidence of cranial and intracranial epidermoids varies between 0.13 and 0.6 per cent, but those found in the middle ear are not included in this estimation. Jefferson and Smalley collected 179 cases of epidermoid growths from the literature and they were distributed as follows:

Type or Location of Tumor	No
Parapontine	63
Parapituitary	49
Fourth ventricle	21
Lateral ventricle	6
Diploic	30
Pineal	1
Suprasellar	1
Intraspinous	8

The diagnosis of the cranial and intracranial epidermoid tumors is based on the long, slowly progressive history and on the clinical findings.

If the tumor is localized to the fourth ventricle, there is evidence of generally increased intracranial pressure and, perhaps, of posterior displacement of the pineal gland despite the fact that the tumor is subtentorial. If there is calcium deposit present, roentgenography reveals shell-like shadows forming the outer portion of the tumor mass. It must be remembered, however, that below the tentorium a calcified shadow may also be the result of an astrocytoma, an ependymoma, or tuberculoma, or even of aneurysm.

If the tumor is in the choroid plexus of a lateral ventricle, it is apt to involve the glomus, again, this tumor may often contain deposits of calcium and differentiation become very difficult. An encephalogram may occasionally help.

It is in the diploë that the epidermoid tumors are most readily diagnosed, because of the defects which they produce in the skull bones. Whether they are situated extracranially, intradiploic, or intracranially, but extradurally, the osseous defects appear on the roentgenograms as more or less irregular areas of rarefaction resulting from pressure atrophy. The margins of the areas are serrated or fairly regular, usually the former, and often are surrounded by a dense bony ring which can be felt by the palpating finger and is almost pathognomonic. In and about the frontal sinuses, and at the base of the skull, the ring may be absent and thus the diagnosis rendered more difficult.

As indicated in the above compilation of Jefferson and Smalley, about 40 per cent of the intracranial epidermoids occur along the brain stem, and perhaps extend into the cerebellopontine angle. Unless they have eroded the adjacent bones or have become calcified, tumors in such locations may well go unrecognized on the roentgenogram.

A great deal of contradictory discussion exists concerning the origin and nature of the epidermoids in or near the middle ear and its adnexa. The commonly found, foul smelling tumefactions, especially if associated with a chronic infection, must undoubtedly



Fig. 1 Epidermoid cyst of the right parietal bone showing the typical well defined margin of the bone defect. This tumor was confined to the diploë.

be classified as cholesteatomas, but occasional epidermoids may occur. In this respect an antrum which is larger unilaterally than the usual 6 or 8 by 10 mm must be regarded with suspicion. On the other hand, an epidermoid located in the petrous pyramid may be recognized on the roentgenogram by the presence of an area of rarefaction in or near the mastoid antrum, and occasionally the mastoid emissary vein may appear enlarged as compared to the opposite side.

All in all, it seems that roentgen studies have a definite value in the diagnosis of most of these tumors. It is quite possible that planigraphy may lead to further additional information.

A bibliography of 71 articles is appended.

T. LEUCUTIA, M.D.

Sprockhoff, H. Postoperative Conditions of Lowered Intracranial Pressure in Brain Operations. A Contribution to the Pathological Physiology of the Cerebrospinal Fluid System. (Postoperative Zustände von Erniedrigung des Schädelinnendrucks bei Hirnoperationen. Beitrag zur Pathophysiologie des Liquorsystems). *Nervenarzt*, 1940, 13, 341.

A pathological lowering of the intracranial pressure was observed in 11 patients following a craniotomy for space-occupying lesions or late traumatic epilepsy. Two had infratentorial, the others supratentorial skull defects. These, however, were

significant in only a of the latter in the others they are only on the edge of an osteoplastic flap. If the defect is large enough it is drawn strongly inward in hypotension and permits no pulsation of the brain beneath the flap of soft parts. At first the patients complain of headache and they are restless and irritable then they become apathetic, their senses become clouded, and they have slight stiffness of the neck, nausea, slight fever and perhaps pallor of the face. The picture can progress to deeper loss of consciousness with fixed pupils, and, finally, to comatose state with Cheyne Stokes respiration. Diagnosis in the absence of defect depends on posture.

The therapy consists of the intrathecal injection of physiological saline to battle the acute danger and giving a large amount of fluid by mouth or intravenous injections of isotonic or hypotonic saline or glucose solutions to restore the normal pressure and caffeine for regulation of the cerebral blood flow which increases the production of fluid by the choroid plexus. An upright position should not be permitted.

From the labidity of the condition Spradckhoff concluded that the essence of the complication is not in the lack of definite amount of fluid alone, but that there is disturbance of the dynamic equilibrium of fluid formation and absorption, i.e., disturbance of the plexus. Therefore, punctures for the injection or removal of fluid should be made as seldom as possible in order not to delay the stabilization of pressure relationships.

Two cases are presented which illustrate these points in a more detailed manner and the author discusses similar symptoms, e.g., headache after lumbar puncture, in cases of chronic hypotension difficulty in skull defects, in old atrophic brains (according to Monakow) after energetic deep ray treatment of the skull (damaging the plexus) and in diffuse trophy of the brain due to severe skull trauma.

Perhaps the kind of tumor (meningioma) or the location of the tumor has an influence on the origin of postoperative hypotension. The hematoma ex vacuo in "ventricular collapse" after operation for hydrocephalus also has its basis in disturbance of the stability of the plexus. Factors of hypotension likewise play a role in the origin of the polymeningitis hemorrhagica of older people in a similar manner.

Finally in regard to drugs, perhaps quinine exerts membrane-closing action on the cells of the plexus. However postoperative circulatory disturbances are never the cause of severe hypotension phenomena, although conceivably they cause a general dehydration of the body. Chloride depletion is of no decisive significance. However, the dehydration treatment should not be used schematically.

The underlying factors which lead to trophy of the plexus—the favoring circumstances—the method of combating the lowering of the fluid pressure prophylaxis, and therapy are presented by the author in a very interesting diagram (the conclusion (GOERTEL) EDWARD W. GIERKE, M.D.

SPINAL CORD AND ITS COVERINGS

Lee F. C. An Osteoplastic Neurolysis Operation for the Cure of Neuralgia Paresthetica. *Surg. 44* 385.

The ideal treatment of neuralgia parasthetica would be one which not only relieves the pain in the thigh but which also restores normal cutaneous sensibility to the painful area. Failures in the past have occurred following resection of the lateral femoral cutaneous nerve because of the formation of a neuroma at the site of nerve section, or because resection was done too far distally to the inguinal ligament. Mistaken diagnosis, also, has produced failures.

Simple neurolysis of the lateral femoral cutaneous nerve may be adequate in some patients, particularly if they have thick layers of subcutaneous fat, but in many persons the old pain will soon recur after such a simple procedure because of new scar formation about the nerve.

Because of complete success in 3 patients with new technique the author presents his rather unique operation. The inguinal ligament is cut, the nerve is freed out of its old bed, and is surrounded if possible by pedicle of fat. A slot is cut in the ilium in posterior to the anterior superior spine and in this slot the nerve free and relaxed, is placed. The inguinal ligament is repaired with interrupted silk sutures. The wound is closed in anatomical layers.

Hemialgia does not result from such section and immediate relief of the inguinal ligament, and the 6-year cure plus x-ray films which show no filling in of the slot, indicate that compression of the nerve by secondary bone growth in the slot is not a complication to be expected. JOHN MARTIN, M.D.

PERIPHERAL NERVES

Bayer W. Peroneus I Injury Due to Trauma of the Knee-Joint Ligament (Zur Peroneussehnenverletzung durch Kniegelenkverletzung des Kniegelenks). *Zentralbl. f. Chir.* 919, p. 67.

The number of injuries involving the motor peroneus of the limb is increasing as a result of sport traffic, and industrial accidents. Among the patients of Hohenlychen there were between the years 1934 and 1939, exclusively of air wounds, 6 with injury of the cervical plexus, 11 injury of the ulna nerve and 7 with injury of the peroneal nerve. The latter group, which is the only peripheral motor nerve, runs extensively immediately under the skin, in proximity to the head of the fibula and in front of the collateral ligament of the fibula and the articular popliteal ligament. In injury to the ligament therefore necessarily affect also the peroneal muscle. However the tenderness of the injury to the ligament does not correspond to the severity of the injury to the peroneus.

In serious lacerations of the ligament, of the entire outer fascia and muscle columns the nerve was often lacerated with blood thin circumference of

from 10 to 12 cm, or it had grown corneous and was partly lifted from its base. Nervous manifestations appeared in such cases immediately after the accident. Eight injuries to the peroneus became evident only after weeks, even months. Usually, these symptoms were no longer considered a result of the accident. In some cases they were erroneously classified as "abortive types of infantile paralysis." However, the absence of general clinical signs in the case history, the circumscribed local paralysis without proliferation of the fatty tissue, without extensive trophoneurosis and with atrophy of the adjacent muscles, point against infantile paralysis and to accidental injury. Inward shaking of the knee joint, open outer joint fissure, atrophy of the outer upper thigh muscles, and pain caused by putting weight on the joint prove the connection between peroneal injury and trauma of the ligament.

Treatment of these late injuries must eliminate the strangulation of the nerve. The leg is therefore immobilized in a plaster cast with medium posture of the joint. Gentle shaking to stimulate the nerve and an attempt to induce better blood circulation almost invariably result in improvement. If conservative treatment fails, or if there is evidence of a serious ligament-nerve injury, surgical intervention is indicated. A plain ligament suture is not sufficient. By displacement of the tip of the musculus vastus the latter is strengthened. In some special cases another silk thread is put through the tendon and muscle, according to Gebhardt-Schulze's method. The nerve is loosened from its corneous strangulation and placed outside of its cicatricial covering. If this proves to be impossible, a support of fatty fascia is used. With the help of this method 3 patients with peroneal injuries recovered after three weeks of complete immobilization in a pelvic plaster cast and the elimination of strain over a period of months. In case of a partial or total transversal severance re-setting must be tried.

Two detailed clinical histories explain the method used.
(RENZ) HILDA H WULLEN

SYMPATHETIC NERVES

Wertheimer, P. *Bilateral Supradiaphragmatic Section of the Splanchnic Nerves in the Surgical Treatment of High Blood Pressure (La splanchicectomie bilatérale sus-diaphragmatique dans le traitement chirurgical de l'hypertension artérielle)* *Presse méd*, Par, 1940, 48: 689.

High blood pressure is a serious condition and causes 25 per cent of the deaths of persons over fifty years of age. Medical treatment has not proved very effective and therefore surgical treatment seems to be indicated.

The operation used by the author consists of bilateral section of the greater and lesser splanchnic nerves in the mediastinum through a double dorsal incision and resection of the lower part of the dorsal sympathetic chain, including, when possible, the last 2 dorsal ganglia. Splanchnicectomy was described

as a therapeutic procedure for high blood pressure by N. Pende as early as 1924, but it was not until 1933 that the details were worked out and it was applied practically by Peet. The author does not give the technical details of the operation but refers to the work of Peet and his own pupil, J. Lecuire, who discussed the operation in a Lyon thesis, No. 77 of 1939. The operation requires minute attention to detail but is not at all dangerous. The only risk is injury to the pleura, and if such a cut occurs it must be sutured or plugged with a bit of muscle or aponeurosis.

Wertheimer describes in detail 4 of the 5 cases which he operated upon by this method. The subjective symptoms stopped in all of the cases after the operation, in 1 case the blood pressure remained at 175/125 after the operation, whereas it had been 215/140 before, in 2 cases the subjective improvement persisted, although the pressure returned to the original figures. In the other cases only the immediate results are known.

The figures shown by Peet's 375 cases are more valuable. Among his patients 76 per cent showed no symptoms after operation, there was improvement in 16 per cent and failure in 8 per cent. There was a reduction of 40 mm. of mercury in the systolic pressure and of 25 mm. in the diastolic pressure in almost half of the cases (48 per cent). Forty-two per cent of the patients had been unable to work before the operation, 69 per cent were restored to normal activity. The operative mortality was only 3.8 per cent, and this was due to operation for wrong indications in the beginning.

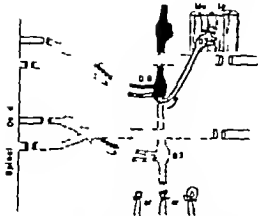
The author believes that uncomplicated hypertension is essentially due to a hypertonia of the sympathetic system, this causes a spasmodic condition of the circulation, which results in ischemia of the kidney and this in turn causes high pressure. Bilateral section of the splanchnic nerves overcomes the vasoconstrictor spasm.

The operation is indicated in uncomplicated and continuous forms of high blood pressure in which the spasmodic element predominates and arteriosclerosis has not yet developed. These spasmodic forms can sometimes be detected by ophthalmological examination. The operation should not be a last resort, but should be considered in any patient under fifty years of age who has a high diastolic pressure and a systolic pressure nearing 200, slight signs of hypertensive retinitis, a slightly enlarged heart shadow, and decreased concentrating activity of the kidneys. It is contraindicated in old age, kidney disease, and heart failure.
AUDREY G. MORGAN, M.D.

Smithwick, R. H. *The Problem of Producing Complete and Lasting Sympathetic Denervation of the Upper Extremity by Preganglionic Section* *Ann Surg*, 1941, 112: 1085.

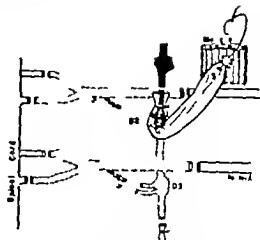
The immediate results of intraspinal root section, the most recent modification of preganglionic section, are satisfactory and complete. Excellent late results (after two or three years) have been ob-

I Intraspal Root Section



With distal ligation of sympathetic trunk.

Fig. The present technique combines intraspinal section of the anterior root with ligation of the distal end of the divided sympathetic trunk. More recently the decentralized second and third ganglia and intervening

b Covering of decentralized ganglion D₂ and D₃ with silk cylinder

trunk has been covered with fine silk cylinder to further guard against regeneration. (Courtesy of J. B. Lippincott Co.)

trunked, but in number of cases moderate to marked evidence of regeneration has occurred. This, however, is usually delayed when compared to regeneration following ramisection and is noticed during the second year in most cases.

The author's method of performing intraspinal root section is by sectioning the posterior roots of the second and third intercostal nerves proximal to the posterior root and by teasing out the intraspinal parts of the anterior roots of these nerves, after separating the attachment of the anastomosis. A potential leak of no consequence results; the nerves are, as usual, resected inward from the lateral portion of the operative field, and the sympathetic chain is sectioned below the third ganglion. The distal end of the divided sympathetic trunk is ligated, and the decentralized second and third ganglia and inter-

vening trunk are covered with fine silk cylinder (Fig. 3).

With intraspinal root section the upper extremities can be thoroughly sympathectomized by interrupting the outflow from the second and third dorsal segments and dividing the sympathetic trunk below the third ganglion (the outflow from D₁ is not important in man). The immediate result is uniformly satisfactory; the late results are variable. Even in the presence of considerable degree of regeneration, the blood flow to the extremity is improved, and the result ortho-while from the patient point of view. Regeneration is rarely complete. It seems reasonable to expect that further precautions which have or can be taken against regeneration will make the late results even more satisfactory. (J. B. Lippincott Co.)

DIAPHRAGMATIC HERNIA

Collective Review

JOSEPH WINBLERG, M D, Omaha, Nebraska

DIAPHRAGMATIC hernia has reached a position of prominence in the field of surgery in recent years largely because of the improvement in roentgenological diagnostic methods. This condition, which was formerly considered a rarity, has been discovered with sufficient frequency during the past few years to make it a matter of consideration in all obscure cases of abdominal and thoracic disturbances. The disease is often difficult to diagnose, not only because it simulates so many other diseases of the respiratory and digestive systems, but also because each case is varied in its symptomatology, changing with the variations in the content of the hernia. For these reasons it often escapes discovery for years after the patient first consults the physician, and frequently it is not recognized until he has been operated on for other conditions, such as gall bladder disease, peptic ulcer, or appendicitis.

This review is a critical examination of the progress made in the study of diaphragmatic hernia during the past few years. Because of the contributions which have been made on the recognition and treatment of congenital hernias occurring in infancy, and esophageal-hiatus hernia, these two types are stressed in the discussion. The reader who is interested in obtaining a comprehensive review of the earlier development of the subject is referred to the study of Hedblom (28) which appeared in 1926, in which are contained the history of the development of the subject, the anatomy, and the clinical aspects.

TYPES OF DIAPHRAGMATIC HERNIA

The various types of diaphragmatic hernia differ greatly in their manifestations, ease of recognition, and treatment. Not only is it necessary to consider the various anatomical groups, such as esophageal-hiatus hernia, retrosternal hernia, and pleuropertoneal hiatus hernia, but a further distinction must be made on the basis of age groups. Diaphragmatic hernia manifesting itself in infancy is a much more serious condition than that which manifests itself in childhood or later life. Experience has shown that the development of serious or even fatal symptoms occurs usually in

infants and young children, while individuals who do not show symptoms until later childhood or adult life may live a normal span without developing fatal complications.

A convenient working classification of diaphragmatic hernia is that of Harrington (24)

I Non-traumatic

A Congenital

- 1 Pleuropertoneal hiatus
- 2 Dome of diaphragm
- 3 Esophageal hiatus
- 4 Foramen of Morgagni (retrosternal hiatus)
- 5 Absence of left dome of diaphragm

B Acquired

- 1 Through point of embryonic fusion
- 2 Through congenital defects (Morgagni)
- 3 Esophageal hiatus (enclosing sac)

II Traumatic

A Indirect injury (usually severe crushing)

B Direct injury

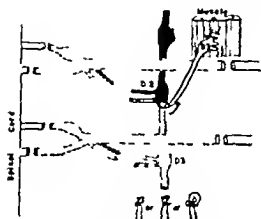
- 1 From gunshot or knife
- 2 Rib fracture tear
- 3 Rupture of subdiaphragmatic abscess

CENTRAL CONSIDERATIONS IN THE MANAGEMENT OF DIAPHRAGMATIC HERNIA

There are certain symptoms which may be present in any of the several types of diaphragmatic hernia and an appreciation of their significance may suggest the diagnosis to the observer. Chief among the abdominal symptoms are pain, vomiting, constipation, and distention. General thoracic symptoms are pain, dyspnea, and difficulty in swallowing. Any or all of these may be present in any of the various types. The symptoms are usually not constant in any given case but undergo frequent changes and depend upon the quantity and kind of abdominal viscera present within the thorax. The physical findings are also inconstant in most cases for the same reason. When abdominal viscera are present within the thoracic cage the most constant signs are tympany, dullness, displacement of the heart, and gurgling sounds in the thorax. There may also be symptoms and signs resulting from constriction or strangulation of special organs such as the stomach and intestines. Diagnosis is not always

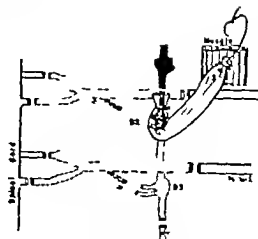
From the University of Nebraska College of Medicine

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With distal ligation of sympathetic trunk.

Fig. The present technique combines intraspinal section of the anterior root with ligation of the distal end of the divided sympathetic trunk. More recently the decentralized second and third ganglia and intervening

b Covering of decentralized ganglion D₂ and D₃ with silk cylinder

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vening trunk are covered with fine silk cylinder (Fig. 1).

With intraspinal root section the upper extremity can be thoroughly sympathetomized by interrupting the outflow from the second and third dorsal ganglia and dividing the sympathetic trunk below the third ganglion (the outflow from D₁ is not important in man). The immediate results are uniformly satisfactory; the late results are variable. Even in the presence of considerable degree of regeneration, the blood flow to the extremity is improved, and the result orthotile from the patient's point of view. Regeneration is rarely complete. It seems reasonable to expect that further precautions such have or can be taken against regeneration will make the late results even more satisfactory. (10) J. B. Lippincott Co.

degree of ether-oxygen or cyclopropane-oxygen anesthesia, with mildly positive pressure applied by use of the tightly fitting face mask. In using positive-pressure anesthesia, the operator should be careful to limit the pressure to that which will sustain life. Actual inflation may cause such accidents as mediastinal emphysema or spontaneous pneumothorax. It has been argued by Miller (45) and his coworkers that positive-pressure anesthesia is not necessary in those cases in which the lung is already collapsed. Apparently they argue that if the lung is already collapsed it cannot be collapsed further. Actually, positive pressure is more necessary if the lung is collapsed, because without it the shift of the intrathoracic structures, which will result from the rush of air, will further decrease the already reduced area of functioning pulmonary tissue, and in addition will cause embarrassment to the heart and great vessels.

According to Adams (1) lung reexpansion following intrathoracic surgery should be brought about chiefly by aspiration of air from the pleural cavity after closure of the wound. One will thus avoid the dangers of emphysema and pneumothorax which might result from excessive pressure within the bronchial tree.

The several types of surgical technique which have been described for repair of congenital diaphragmatic hernia in infants and children differ principally in the method of approach. It is generally agreed that the abdominal or thoracic approach used alone is better than a combination of the two, but in some instances it has been found necessary to use the combination because of the failure of either the abdominal or the thoracic approach alone to allow reduction of the herniated viscera. The chief argument advanced for the thoracic approach is that adhesions are more easily separated through this exposure. Even if this is true, adhesions are encountered so rarely in congenital cases operated on in early life that it would seem preferable to use the abdominal approach because of its other advantages. In the absence of adhesions it is much more difficult to return the herniated structures to the abdomen from the thoracic side than from the abdominal side. Another important argument for the abdominal approach is the fact that the herniated structures can be inspected after they are returned to the abdomen. Considerable difficulty may be encountered in returning the herniated contents, especially the intestines, from the abdominal side. The resistance to their return may be great enough to give the impression that adhesions are present. Some years ago C. H. Mayo (40) recommended

the introduction of a rubber tube through the aperture in the diaphragm for the purpose of overcoming the reduced pressure within the thorax, thus allowing the intestines to escape from the thorax without resistance. The tube, about $\frac{5}{8}$ in in diameter, removes the vacuum within the thorax by allowing the entrance of air. This maneuver is an effective means of dislodging the structures without trauma and its use may prevent complications arising from rough handling of the intestines.

One of the most troublesome technical difficulties in the surgical repair of these cases is the closure of large apertures. Usually the simple device of placing clamps around the margin of the defect and using them for traction to approximate the edges of the ring is sufficient to obtain a closure. It is rarely necessary to paralyze the diaphragm by interruption of the phrenic nerve since the diaphragm in young children has little resistance. Hernias on the right side should be repaired through the thoracic approach since the liver would interfere with exposure of the defect on this side. The method described by Sloan (50), in which long vulsella like forceps are used to raise the hernial ring and thus allow easier reduction of the contents, will facilitate repair in difficult cases in which the thoracic approach is used. Bettman (7) has described a method which he has successfully used with the thoracic approach in which the ribs adjacent to the defect are fractured and then pressed inward to approximate the thoracic wall and the edges of the hernial ring. Bird (8) has simplified the closure of defects next to the ribs by section and inward displacement of portions of the ninth, tenth, and eleventh ribs opposite the defect. Very large defects may be closed through the abdominal route by displacing the broad expanse of renal fascia upward and attaching it to the medial edge of the ring (5, 57, 58). This layer of fascia, which is the continuation of the anterior sheath of the psoas muscle, is sufficiently firm and sufficiently mobile to make it an ideal tissue for the closure of lateral defects. There are a few precautions to be observed with its use, the most important being to use care to avoid injury to the artery to the adrenal gland, which lies in close proximity to the posterior aspect of the fascia. There is also the danger of accidentally ligating the lienal artery because of its displacement with herniation of the spleen. It will be found helpful to leave most of the small intestine, wrapped in gauze soaked with normal saline solution, outside of the abdomen while the closure is being made. One will be able to obtain better exposure by this means, and will avoid unnecessary trauma to the

easily made from the symptoms and physical findings and it is not unusual to have the diagnosis first made at the autopsy table. Occasionally the hernia is first discovered during operation for the relief of intestinal obstruction. Any abdominal or thoracic disturbance which calls for x-ray examination may lead to the absolute diagnosis of diaphragmatic hernia. However unless the x-ray examination is made by methods directed specifically at the detection of diaphragmatic hernia the diagnosis may be missed. Unger and Poppel (56) emphasize the importance of using a special technique which includes fluoroscopic and roentgenological examination of the esophagus and gastro-intestinal tract in the supine, Trendelenburg, lateral, recumbent and upright positions. Other findings which may be revealed are gas and fluid levels in the thorax, changes in the lungs, and abnormalities in the position, shape, contour and movement of the diaphragm.

DIAPHRAGMATIC HERNIA IN INFANCY AND EARLY CHILDHOOD

The peculiarities of diaphragmatic hernia in infancy and early childhood place it apart from other types in the matter of management. The fact that almost all infants showing symptoms in the first few months of life die within the year (Keith 34, Hedblom 39 and Latta 37) is proof of its seriousness. The defect is usually in the posterolateral region of the left hemidiaphragm and is the result of failure of closure of the pleuroperitoneal hiatus, usually on the left side or through pressure against an inadequate closure. Less common disturbances are esophageal-hiatus hernia, hernia through the retrosternal foramen (foramen of Morgagni) defects in either left or right hemidiaphragm not related to the above and defects in either hemidiaphragm other than these apertures (Hartzell 36). Kerr and Steinberg (35) describe 3 cases of diaphragmatic hernia on the right side in infants and state that the incidence of congenital hernia on the right side is about 9 per cent in congenital cases.

The symptoms and signs are due to the presence of abdominal structures within the pleural cavity. Difficulty in breathing immediately after birth should always suggest the possibility of a defect in the diaphragm. This symptom is usually inconstant; there may be a moderation of a few days, only to have it reappear in a few weeks or months. Other symptoms and findings which may suggest the diagnosis are failure to take feedings, normally dyspnea, full chest and small abdomen (giving the infant the appearance of a young Hercules), displacement of the heart, the

absence of breath sounds over the affected side and failure to gain weight normally (Weinberg 57). These findings should suggest x-ray examination with a barium meal which is the absolute means of establishing the diagnosis. The bearing thorax if present, is especially suggestive. Daly (17) describes a child who lived eight hours as having the anterior thoracic wall "rounded up into a lump." Cyanosis is mentioned as an important sign by Merger and De Lignerres (43) and Meyer and Hoffman (44). One would expect this sign to be present only with extreme respiratory embarrassment and its absence would not preclude an advanced degree of herniation.

Until a few years ago it was the attitude of leaders in surgery that the hazards of repair of diaphragmatic hernia in infants were so great that operation should be performed only as a palliative measure to relieve the complication of intestinal obstruction. Since then there has been a sufficiently large number of successes in infants less than a year old to prove that age is no barrier. Too often operation is withheld until the infant is in extreme either from intestinal obstruction or from respiratory and circulatory embarrassment, and attempts at repair are made under most unfavorable conditions. Donovan (18) calling attention to the dangers of delayed operation, recommends surgical treatment if part of the intestinal tract is involved, because of the danger of intestinal obstruction. This statement is supported by Hartzell's analysis of 63 cases of patients under ten years of age which were operated on. Of these 56 without intestinal obstruction showed an operative mortality of 35 per cent, while 8 with intestinal obstruction showed an operative mortality of 66½ per cent.

The importance of anesthesia in determining the success or failure of the operation is stressed by most surgeons writing on this subject. It should be appreciated that for practical purposes the operator is dealing with an open thorax even though an abdominal approach is used. It should take little argument to convince him that with already embarrassed respiration the sudden influx of air with the opening of the abdomen or thorax is very liable to cause pulmonary collapse and that he must be prepared to use positive-pressure anesthesia whenever this danger threatens. While it is true that some patients will withstand this sudden change of pressure, the mere fact that a number of the cases can be dealt with without positive pressure is no argument against having it in readiness at all times. The technique of anesthesia which we prefer is preliminary local anesthesia, followed by the maintenance of mild

cause of bleeding in some cases was ulceration of the stomach or esophagus at the site of the hernial ring. The autopsied cases in the series reported by Bock and his coworkers showed no evidence of ulceration, and the authors considered venous congestion as the most likely cause of the bleeding. Before accepting this conclusion one would have to rule out the presence of small superficial ulcers which were not discovered at autopsy. There is also the possibility that the anemia is not related to the hernia in some cases. The comparatively large number of cases which have been reported in recent years would indicate, however, that the association of anemia and hernia is no mere coincidence and that hernia should be considered in all obscure cases of secondary anemia.

The occasional occurrence of stricture in the lower third of the esophagus with hiatal hernia may give rise to confusion. This complication in the older age groups makes one suspect the possibility of carcinoma, and the occasional presence of carcinoma of the esophagus together with hernia (Jacobs 33) makes the possibility of this confusion the greater. Progressive constriction in the lower third of the esophagus with a history of a disturbance suggesting gall-bladder or gastrointestinal disease over a period of years should suggest the possibility of this disturbance.

Improved methods of roentgenology together with an awareness of the possibility of hiatal hernia are responsible for the great increase in the diagnosis of this condition. What applies to diaphragmatic hernia in general in the method of making the roentgenological examination applies to the esophageal hiatus type, since, in the early cases without adhesions, the stomach and other abdominal viscera may not be herniated at the time of x-ray examination, and ordinary methods of examination may give no clue to the diagnosis. The roentgenological findings which Ude and Rigler (55) emphasize as being of importance are:

1. Protrusion of a portion of the stomach through the esophageal hiatus.
2. Distention of the lower part of the esophagus.
3. Demonstration of the dilatation of the hiatus by the stomach ruga markings in the herniated portion.
4. Changes in the contour of the stomach.

If roentgenological examination is performed routinely on large groups of cases many instances of small pouchings of the stomach through the relaxed hiatal ring will be discovered but most of these have no clinical significance. One must, therefore, be wary of assuming that an abdominal or thoracic disturbance is due to hiatal hernia on such evidence alone.

Moersch (46), Jackson and Jackson (31), and Monkhouse and Montgomery (47) stress the value of endoscopic examination of the esophagus and herniated stomach in cases in which there is doubt regarding the type of lesion which exists. A superficial erosive ulcer may be visualized at the site of the hernial ring and at the junction of the stomach and esophagus in occasional instances. It is possible that progressive constriction resulting from these ulcers accounts for the esophageal obstruction found in some cases.

Thoracic stomach with short esophagus has been described with increasing frequency during the past several years. These cases must be considered apart from other types of hiatal hernia, especially from the standpoint of treatment, since the short esophagus precludes or makes difficult the placement of the stomach in its normal position below the diaphragm. The diagnosis is often made without sufficient evidence, and it is a safe rule to classify only those cases in which the position is demonstrated by operation or autopsy as being definitely within this group (Jacobs, Tweedie, and Negus 32). Manges and Clerf (38) advise that the stomach and esophagus be filled completely with the barium meal to make the diagnosis, and that roentgenograms be taken from many angles. The findings with esophagoscopy include short esophagus, narrowing of the esophagogastric junction, finding of a portion of the stomach above the diaphragm, absence of a normal esophageal hiatus, and ulcers in some cases, usually at the junction of the esophagus and stomach. Further evidence may be obtained by biopsy study (Block, Serby, and Salinger 9). The reason for the occurrence of a short esophagus with the thoracic stomach is not clear. Theories of the cause include deficient fixation of the esophagus to the hiatus, congenital failure of development of the esophagus, herniation of the stomach through the esophageal hiatus with later shortening of the esophagus due to ulceration, and cessation of traction on the esophagus by the stomach which has assumed a position in the thorax (52, 16, 25). In view of the fact that most of the cases diagnosed as short esophagus which have come to operation have proved to be hiatal hernias without shortening, one should be reluctant to make an absolute diagnosis of this rare condition.

A very definite advance in the management of the esophageal hiatus hernias is the recognition by surgeons and internists alike that many cases may be treated by medical therapy without surgical intervention. The various methods which find application in the treatment of this condition may be classified under four headings:

abdominal viscera. This is an important consideration, since the less trauma there is to the intestine during the operation the less likelihood there is of later distention and obstruction.

ESOPHAGEAL HIATUS HERNIA

Esophageal-hiatus hernia is much like indirect inguinal hernia in that both are due to a congenital weakness, but usually do not make their appearance until youth or adult age. However, also like inguinal hernia it may be fully developed at any age. Akerlund (2) classifies hiatus hernias as follows:

1. Hiatus hernia with congenital shortened esophagus.

2. Para-esophageal hiatus hernia.

3. Other types of hiatus hernia, for example, circumscribed eventration or diverticulum of the esophagus around the hiatus.

Para-esophageal hiatus hernia which is the most common type, is classified by Harrington (25) into

1. Cases with an esophagus of normal length in which the lower end is not elevated above the diaphragm but a portion of the stomach is herniated into the posterior mediastinum.

2. Cases with an esophagus of normal length in which the lower end is elevated above the level of the diaphragm and the herniated stomach is in the posterior mediastinum.

It is generally thought that esophageal-hiatus hernia is due to deficient fixation of the esophagus to the hiatus or to relaxation of the crura of the diaphragm as a part of a general muscular relaxation (Cowan 16). Harrington believes that the congenitally defective hiatus is unable to withstand the pulsion and traction effects of intra-abdominal and intrathoracic pressures. Only 10 per cent of his series of 123 cases gave a history of injury and in $\frac{1}{3}$ of these there were some symptoms before injury. Truendale (53) is of the opinion that those cases which appear later in life are due to weak and greatly stretching crura; other wise they should appear early in life. This appears to be the consensus of opinion. The recent widespread interest in the subject of esophageal hiatus hernia has brought to light many cases. The symptoms are chiefly those due to the presence of the stomach above the diaphragm, and they frequently simulate those of other diseases of the abdomen and thorax, including such gastroenterological conditions as gastritis, gastric ulcer or cancer, pylorospasm, duodenal ulcer or cholecystitis, esophageal conditions such as cardiospasm, diverticulum, stricture or carcinoma and cardiac conditions such as angina pectoris, coro-

nary occlusion, and myocardial insufficiency (Morton 48, Harrington 25, Cowan 16). Mistakes in diagnosis, even to the point of operating on individuals for erroneously diagnosed conditions such as gall bladder disease, gastric ulcer and duodenal ulcer must occur with much greater frequency than is generally supposed if one may judge from the high percentage of cases of diaphragmatic hernia which have previously been operated on for other conditions (2, 16, 25, 48, 53). While esophageal hiatus hernia may be confused with many diseases of the thorax and abdomen, there is more uniformity in the manifestations of this type of hernia than with most other diaphragmatic types. According to Harrington these symptoms are based upon intermittent or progressive incarceration and obstruction of the stomach. This may cause epigastric distress extending to the back, usually shortly after a heavy or even ordinary meal, which is relieved by vomiting or eructation. Later there may be agonizing pain and difficulty in vomiting because of fixation of the stomach. Other symptoms suggestive of the condition are phrenic shoulder pain, dyspnea and a sense of intrathoracic pressure which is made worse by lying down. A careful elicited history of these symptoms becoming progressively worse may lead to the diagnosis even in obscure cases, especially when gall bladder disease is suspected but is indefinite. On the other hand, if the diagnosis is not suspected it may be missed even at the operating table and it is probably true that many cases operated on for gall-bladder disease in which the gall bladder was found to be normal have been cases of esophageal-hiatus hernia.

Attention has been centered in recent years particularly upon anemia due to a slow blood loss resulting from mechanical conditions imposed upon the stomach by the esophageal ring. Block, Dullin, and Brooke () have given very complete account of this association in their presentation of 5 cases. The most important lead to the diagnosis in their cases was repeated attacks of anemia. Among others who have emphasized the occurrence of attacks of anemia as an important association of hiatal hernia are Andrews (4), Mithras (39), Cowan (16), Moench (46), Harrington (25), Feldman (20), and Gordiner (). Bergensfield (6) reports a case of hematemesis in an eighteen month-old boy in which there was cessation of bleeding after repair of the defect, and Christensen () reports the case of a child one year old in which the esophageal hiatus hernia was associated with hematemesis. In most reports the association of anemia and hernia occurred in the older age groups. The apparent

proach may be found useful, just as with other types of diaphragmatic hernia (Andre 3)

TRAUMATIC DIAPHRAGMATIC HERNIA

Traumatic diaphragmatic hernia may be due to either direct or indirect violence, the former being the result of stab wounds, tears by fractured ribs, or perforations due to missiles which penetrate the lower part of the thoracic or abdominal wall. One would think that war injuries would cause far more hernias of the diaphragm than are generally seen by the army surgeon, but, as Truesdale and Phippen (54) have pointed out, missiles which penetrate the diaphragm usually cause immediately fatal injuries. The indirect hernias are due to forceful compression injuries of the abdomen which cause sudden tension on the diaphragm. Even sneezing has been designated as a cause (McMullin, McArthur, and Weber 41).

The repair of traumatic hernias by the thoracic approach has several arguments in its favor (Hedblom 27, Schiffbauer 49, and Truesdale and Phippen 54). The thoracic viscera are more easily inspected for possible injury, and adhesions are more easily divided. As adhesions are almost always present in late traumatic diaphragmatic hernia, any method which facilitates their separation is an important consideration. An argument against the thoracic approach is the difficulty of dealing with abdominal viscera which may be injured. One may be governed to a considerable degree by the level of entrance and the direction of the rupturing force in choosing the approach for the repair.

SUMMARY

1 The utilization of the x-rays has made it possible to recognize diaphragmatic hernia with greater frequency than was possible before the development of a better roentgenological technique. This has helped uncover a greater number of cases of diaphragmatic hernia and has been particularly valuable for the recognition of obscure cases in which the symptoms are poorly defined.

2 Harrington's classification of diaphragmatic hernia is adaptable to clinical grouping of the various types.

3 The peculiarities of diaphragmatic hernia in infancy and early childhood are distinctly different from those encountered in the adult and the treatment must necessarily differ accordingly.

4 The procedures employed in the different types of hernia are discussed, and particular reference is made to the relative merits of abdominal and thoracic approaches.

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SURGERY OF THE THORAX

CHEST WALL AND BREAST

Schrire, T Stab Wounds of the Chest *Brit M J*, 1940, 2 662

In Capetown, stab wounds have become extremely common. One hospital, serving the town and neighboring suburbs, has treated 600 cases annually. From such a multitude of cases, it was not difficult to get a number large enough to draw some broad conclusions.

Unless the condition of the patient was so bad as to render any operative intervention an entirely hopeless procedure, every patient with penetrating wounds of the chest admitted under the care of the author was subjected to an exploratory thoracotomy as an emergency measure, if he was seen within twelve hours of the injury. As a rule, the diagnosis was obvious, the presence of surgical emphysema, pneumothorax on the same side, and shift of the apex beat were at all times considered evidence of penetration. Associated injury and multiple stab wounds were frequent.

The author describes the pre operative treatment, the anesthetic, the incision, and the operation. Re section of the rib is performed if necessary. A rib separator is also introduced. All hemorrhage must be controlled, and the blood in the pleura evacuated by mopping, in preference to suction. The lungs are grasped with a lung forceps and lifted up into the wound, and the surfaces of each lobe are examined. The penetrating wounds are sutured. The pleural surfaces usually come into apposition easily, if not, one or two extra stitches bring them together. The diaphragm is stitched with two layers of catgut. Before stitching the diaphragm, it is advisable to crush the phrenic nerve as it lies on the pericardium. Wounds of the heart are treated by suturing with chromic catgut No. 2. The pericardium is left widely open and is allowed to drain into the left or right pleura. No separate drain is used for the pericardium. Before the chest is closed, a No. 14 self-retaining catheter is put into a separate stab wound low down in the posterior axillary line.

Following the operation, the patient is returned to bed and the drainage tube is led under water. He is sat up as soon as he recovers from the anesthesia, is nourished in the Fowler position, and given inhalations of carbon dioxide for two to three minutes every half hour for the first twenty-four hours. In addition, he has been given full doses of sulfonamide for the first few days. The tube is removed after thirty-six hours, during the first twenty-four of which about 8 to 10 oz. of blood stained fluid are discharged, during the last twelve hours, there is practically no discharge. The purpose is to get the lungs reexpanded as soon as possible. He has not seen a tension pneumothorax develop after suturing in his series, but he uses a wide self retaining tube,

to be on the safe side. The patients move about freely in their beds after the drainage tube is removed and do not complain of any pain. The author believes it essential to keep the lungs fully aerated and not to allow the bronchi to become blocked with secretion or blood. Coughing is encouraged.

In all, 17 patients were treated by the above method, with 1 death. For comparison, 9 patients were treated conservatively. It is the author's belief or impression that operation in these cases is worthwhile. EARL C. ROBERTS, M.D.

Rovida, F. Extrapleural Abscesses (Degli ascessi extrapleurici) *Radiol med*, 1940, 27 768

Extrapleural abscesses are formed between the pleura and the wall of the thorax. The clinical symptoms are generally slight. The patient may have a vague pain at the site of the abscess and a cough. If the abscess is tuberculous in nature the absence of pain is characteristic. There may be an external swelling covered with skin that is edematous but not red or fixed. This swelling appears in



Fig. 1

the intercostal spaces but is not pathognomonic of extrapleural abscess. These abscesses may be divided into 3 groups depending on their point of origin they may develop in the soft parts of the wall of the thorax or they may originate from foci, either tuberculous or septic in the ribs. Probably the great majority of them originate from pyemic or tuberculous foci in the ribs.

Diagrammatic sketches are given illustrating the method of propagation of these abscesses and 4 cases are described in detail and illustrated with roentgenograms. The roentgenogram reproduced here (Fig. 3) shows a typical case of solitary extrapleural abscess on the left side in tuberculosis. Some of the roentgenograms in the original article show a series of such abscesses along the wall of the thorax. These abscesses show shadows the margins of which extend laterally the transparency of the lung. In the tangential projection the outline extending toward the lung is quite characteristic, which makes it possible to differentiate the abscess from other conditions, such as, for example, sacculated parietal empyema. The shadow of an extrapleural abscess is longer in its horizontal than in its vertical diameter and the maximum convexity lies opposite the center of the base on which it is implanted. When examination is made in the tangential projection during respiration the outline fluctuates on inspiration and returns to its original position on expiration. Differential diagnosis from other conditions such as tumor and pneumonia is discussed.

If the ribs are involved, treatment should be surgical, whether the infection is pyogenic or tuberculous. If the abscess is tuberculous and in the beginning stage and the ribs are not involved, physical and medical treatment may be tried. Roentgen examination of value in determining the treatment to be used and following up the course of the lesion under treatment.

MURRAY C. MORGAN, M.D.

Moratti, A. Pre-Operative Radiotherapy of Cancer of the Breast (*Sulla radioterapia preoperatoria del cancro della mammella*). *Radiol med.* 9:10, 27, 783.

The author discusses 35 cases of cancer of the breast given pre-operative radiotherapy between 1919 and 1938. A table is given which shows the details of the treatment and the results. When the report was written the average time since the beginning of treatment was three years, the shortest time five months, and the longest more than seventeen years. Ten of the patients, or 28 per cent, were in the first stage, 9, or 26 per cent, were in the second stage, and 4, or 12 per cent, were in the third stage (according to Portman classification).

The treatment was roentgen irradiation except in one case in which 3 mgm. of radium were applied for ninety-six hours. In another case in addition to the administration of 3,000 roentgens, 5 mgm. of radium were applied for twenty-five minutes the day before operation. The tension used was from 300 to 500 k.v. In the first and second stages the breast and

axillary region were irradiated, in the third stage the supraclavicular region was also irradiated and in cases of very large tumor in the third stage posterior irradiation was given also. The factors of irradiation were average doses, from 1,400 to 2,800 roentgens per field, the anticathode-skin distance from 50 to 60 cm., filter .5 mm. of copper and .5 mm. of aluminum and daily irradiations.

Of the 35 patients 30 were operated on in the second or third month after the beginning of irradiation. At least three weeks should elapse between the end of roentgen treatment and the operation.

It has been claimed that the delay in operation entailed in radiotherapy is dangerous and that pre-operative irradiation makes operation more difficult. In this series there was no difficulty in operation except that perhaps in some cases hemostasis was somewhat more difficult. It has also been claimed that roentgen irradiation injures the lung tissue and tends to cause pleuropneumonia. The author found that there was no danger of lung complications if lung disease was excluded before operation and careful roentgen technique was used.

Histological examination showed great changes in the tumor tissue after irradiation. Hard, scirrhous cancers were affected less than others. As a general thing these changes became manifest three weeks after irradiation, as shown by serial biopsies in case.

Fourteen patients were found free of signs of recurrence after an average interval of more than four years after treatment. Both of the patients who had had the first stage were living and free of recurrence among the 9 in the second stage there had been recurrence (11 per cent), and among the 14 in the third stage there had been recurrences, 11 (78 per cent). These results are better than those of other thorax operations alone. The time that elapsed between operation and recurrence was also longer than the statistics reported for operation alone.

The number of cases reported is small, but they show that the dangers attributed to pre-operative irradiation are not real. Irradiation followed by satisfactory results in the first and second stages, and even in the third stage the tumors were sometimes rendered operable. Therefore the method is worthy of more extended use.

V. DEBENI (MORATTI), M.D.

TRACHEA, LUNGS, AND PLEURA

Scartozzi, G. The Metabolism of Oxalic Acid in Patients with Pleuropulmonary Suppuration (*Metabolismo dell'acido ossalico nei malati di suppurazione pleuropulmonare*). *Pulsio* Rome, 1940, 47, 303, 310, 476.

The author studied the oxalic acid metabolism in a series of 5 cases of pleuropulmonary suppuration. He notes that oxalic acid in the body may be either of endogenous or exogenous origin. Exogenous oxalic acid is introduced in such foods as cocoa, and spin-

ach, or results from microbic fermentation in the gastro intestinal tract. Endogenous oxalic acid is derived from the intermediary metabolism of nucleoproteids and amino acids, fats, purine substances, but, above all, from carbohydrates. In fact, the blood sugar curve is paralleled by the blood-oxalate curve. This demonstrates the intimate relation between the metabolism of the carbohydrates and oxalic acid.

Disturbances of the liver affect the carbohydrate metabolism, and likewise the oxalic-acid metabolism. Studies of oxalic acid metabolism on hepatic, diabetic, and tuberculous patients indicate a hyperoxalemia. Normal values for blood oxalic acid fluctuate between 2 and 6 mgm per 100 ccm. The twenty-four hour urine usually contains from 50 to 120 mgm total excretion.

The author found in the clinical cases reported a hyperoxalemia in the presence of pleuropulmonary suppuration. He ascribes this to the endogenous metabolism. Hepatic insufficiency in such cases may also be a cause of the hyperoxalemia. We know that chronic pulmonary suppuration may depress hepatic function and even cause amyloid degeneration. The author also found an increase in the urinary excretion of oxalic acid in such cases. With improvement of the patient's condition the blood and urinary oxalates return to normal. JACOB F. KLEIN, M.D.

Symposium on Carcinoma of the Lung. Halpert, B. *Morphological Aspects of Carcinoma of the Lung.* Singer, J. J. *Primary Bronchogenic Carcinoma.* Moore, S. *Body-Section Radiography in Malignancy of the Lower Respiratory Tract.* Hollinger, P., and Radner, D. B. *Bronchoscopic Diagnosis of Bronchial Carcinoma.* Craver, L. F. *Diagnosis of Malignant Lung Tumors by Aspiration Biopsy and by Sputum Examination.* Churchill, L. D. *Resection of the Lung.* Ochsner, A. and DeBakey, M. *Surgical Considerations of Primary Carcinoma of the Lung.* *Surgeons*, 1940, 5, 903-1023.

HALPERT states that among 7,433 autopsies at Charity Hospital, New Orleans, there were 92 cases of carcinoma of the lung, which incidence was more than half as frequent as carcinoma of the stomach. The proportion of males to females was 14:1 and the majority of the patients were between forty and sixty years of age. In 42 cases the growth was located in the right or left stem of the bronchus, in 35 cases it was located in a branch bronchus.

Halpert's concept is that the parent cell of all carcinomas of the lung is the reserve-cell. He classifies carcinomas of the lung as squamous cell, columnar cell and reserve cell carcinomas.

In the squamous cell type the tumor cells are arranged more or less concentrically to form epithelial pearls, and the cells toward the centers of the cell nest disclose varying degrees of keratinization or are transformed into keratinized scales or debris. In the columnar cell type the tumor cells are columnar or cuboidal and are arranged in acinar, tubular or papillary structures. In the reserve cell

type the tumor cells are of the same size, their nuclei are round, oval, or elongated and stain deeply, their cytoplasm is scanty, and their borders are scarcely discernible. The cellular arrangement forms no particular pattern. In some, growth of the cells is arranged in whorls, in others, there is a palisade arrangement of the peripheral cells.

Among the 92 cases, 40 were squamous cell, 17 were columnar-cell, and 26 were reserve cell carcinomas.

The tumor usually originates in the mucous membrane of a bronchus or a branch and extends into the deeper layers. The regional lymph nodes are first involved and later more distant lymph nodes. Metastasis into distant organs occurs.

SINGER states that carcinoma occurs most frequently between the ages of forty and seventy. A case has been reported in a sixteen-month old child. The proportion between males and females is 4 to 1, and between the right and left lung 60:40.

The early symptoms are cough, chest pain, wheeze, dyspnea, and hemoptysis. The late symptoms are those of advanced malignancy. Most patients manifest the important symptoms which precede their death from one to fifteen months. There is no known definite relation to occupation.

The roentgen ray picture is not due entirely to the tumor mass, but to the mass plus the complicating pathology such as atelectasis, bronchiectasis, pneumonia, abscess, pleural effusion, pleural thickening, or obstructive emphysema.

The most important complications are varying degrees of atelectasis, abscess, bronchiectasis, pleural effusion, emphysema, and spontaneous pneumothorax.

Physical signs are so variable that they are not reliable. Diagnosis can be established by a careful history and physical examination, sputum examination, fluoroscopy, bronchoscopy, bronchography, and roentgenography, by diagnostic puncture and aspiration biopsy, and occasionally by thoracoscopic examination or exploratory thoracotomy.

MOORE says that 65 per cent of cases of bronchiogenic carcinoma can be diagnosed by bronchoscopy and 35 per cent cannot. Any means which will aid in the discovery of the early occluding lesion should reduce the number that cannot be diagnosed. Body section roentgenography consists in employing a properly coordinated movement of x-ray tube and film during the x-ray exposure with the result that a predetermined layer in the body can be shown with more or less exclusion of the structures lying above or below the layer under examination. The five major types of apparatus are the stratigraph (Allkhona), planigraph (Ziedes des Plantes) tomograph (Grisnabb and Chaoul), laminagraph (Kieffer and Moore), and the biotome of Boerge.

Body section roentgenography is of the greatest value in the examination of the respiratory tract. It has proved a great help in diagnosing obscure lesions and with increasing use and experience it

should aid greatly in diagnosing and localizing bronchogenic tumors.

HOLLIGER and RADEN report that the purpose of bronchoscopy as an aid in the diagnosis of bronchogenic carcinoma is (1) to study the character of the lesion (2) to not accurately its location and determine its extent along the bronchial walls (3) to secure tissue for biopsy and thus reveal the exact nature of the growth and (4) to aid in determining operability by noting evidence of lack of evidence of metastasis.

Symptoms of unexplained cough, hemoptysis of unknown origin, or fevers demand a thorough examination including bronchoscopy to determine their cause. When x-rays suggest bronchial obstruction with either atelectasis or emphysema, pneumonitis or suppuration, bronchoscopic examination is imperative. Early carcinoma of the bronchus produces but few symptoms and x-ray findings are negative in the early stage.

There are three types of tumors that may produce bronchial obstruction (1) endobronchial (2) peribronchial, producing thickening of the bronchial wall and (3) extrabronchial, obstruction being produced by compression of the bronchus.

Biopsy is positive in approximately 75 per cent of the cases. The bronchoscopic picture is, of course, variable. The aid of retrograde bronchoscope (Tucker) is necessary to examine the upper lobe bronchi.

A thickened, widened carina indicates involvement of the mediastinal lymph glands.

Bronchoscopy has little to offer therapeutically in the treatment of carcinoma of the bronchus. Palliation may be obtained occasionally by electrocoagulation, radon, or radium implantation.

CRAIG states that either the modern surgical or the modern radiological treatment of cancer of the lung is such a radical procedure, and so hazardous to the patient that it should not be undertaken without good evidence of its necessity.

In a number of patients diagnosis cannot be proved with the bronchoscope or x-rays. Thoracotomy is a major surgical procedure and should not be resorted to as diagnostic procedure except in unusual cases. Thoracoscopy may help to determine the presence of pleural metastasis. Examination of sedimented or centrifuged pleural fluid is notoriously unreliable in making diagnosis of cancer of the lung.

For more than ten years aspiration biopsy has been used with increasing frequency at the Memorial Hospital. During the years from 1935 to 1939, the diagnosis of 5.6 per cent of the cases histologically proved as carcinoma was established by aspiration biopsy.

When all methods have failed to establish the diagnosis, aspiration biopsy is used.

Accurate localization of the tumor is made with the aid of the fluoroscope. Previously this was done in the erect posture but now the patient is placed in the prone position with his head slightly lower

than the body to avoid cerebral air embolism. A biplane fluoroscope would be of great help.

A detailed description of the technique is described and should be carefully studied by one undertaking to do this procedure.

The chief danger is air embolism, which should be lessened by placing the patient in the recumbent posture. Expectoration of small amounts of blood not infrequently occurs. The development of emphysema or lung necrosis or growth of tumor along the needle tract has not occurred at this hospital.

CRAIG and his clinic general inhalation anesthesia with ether vapor oxygen is administered through a intratracheal tube with closed system that permits the maintenance of differential pressure and affords ready access for suction of the tracheobronchial tree.

Churchill employs a posterior approach through the bed of the eighth rib for lower lobectomy, a posterolateral incision at a level between the fifth and seventh ribs for pneumonectomy, a posterolateral or anterolateral incision for the upper lobe, and an antero-lateral incision for the middle lobe.

The author then describes in detail the technical procedures and their application to various types of diseases of the lungs. The reader is referred to the original article for them.

Churchill does not think that preliminary artificial pneumothorax is of any particular value in the preoperative preparation of patients for pneumonectomy or lobectomy.

He reports his hospital mortality rate for all pulmonary resections during ten-year period as follows:

Condition	Number of Resections	Deaths in Hospital	Per Cent of Deaths in Hospital
Bronchiectasis	31	4	13
Lung abscess	25	5	20
Cystic disease	6	—	51.3
T. bronchialis	5	—	80
Benign tumors	—	—	3
Malignant tumors	35	6	45
Total	82	30	38

Type of Operation	Number of Operations	Deaths in Hospital	Per Cent of Deaths in Hospital
Lobectomy	—	—	—
Partial	6	—	—
Complete	66	9	—
Total	72	9	5

Pneumonectomy	Number of Operations	Deaths in Hospital	Per Cent of Deaths in Hospital
Single stage	40	9	—
Lobar stages	6	—	—
Total	46	9	43.5

All resections	82	30	38
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OSCHNER and DEBARY report that there is actual increase in the frequency of carcinoma of the lungs. A review of the literature and their own ex-

perience would indicate that irradiation therapy is of no benefit in the treatment of bronchiogenic carcinoma. Total removal of the lung and mediastinal lymph nodes is feasible and offers the only hope of cure. Early diagnosis is essential to successful operation. Operability can be absolutely determined only by exploratory thoracotomy, and they urge that it should be done on all cases that are not obviously inoperable.

The authors have discussed in detail the pre-operative management, the anesthesia, and the technique of individual ligation of the hilar structures. They believe that the pre-operative administration of civitamic acid and thiamine chloride is helpful. The pre-operative establishment of artificial pneumothorax is important. They condemn lobectomy and pneumonectomy by the tourniquet technique as inadequate and believe that pneumonectomy by the individual ligation technique with removal of the mediastinal lymph glands is the operation of choice.

They have presented an analysis of 139 collected and 19 personal cases, 94 per cent of which were primary carcinoma and 29 per cent primary sarcoma. The total mortality in this group was 45 per cent. The follow up results of 67 of 83 collected cases, including theirs, show that 70 per cent of the patients are still living. In their series of 19 cases, 10 patients recovered following operation. Of these, 7 are still living, the longest survival being four and one-half years. JULIAN A MOORE, M D

Longacre, J J, and Johansmann, R. An Experimental Study of the Fate of the Remaining Lung Following Total Pneumonectomy. *J Thoracic Surg*, 1940, 10 131

The authors undertook to study the changes in the remaining lung following pneumonectomy in dogs with a view to solving the following problems:

1. What is the fate of the remaining lung after years of carrying the added strain?

2. Will this fate in those young developing animals operated upon while the growth factor is still present be identical to that in animals subjected to pneumonectomy after maturity is reached?

3. In time, will the compensatory dilatation noted in the adult animals following pneumonectomy terminate in true pathological emphysema with all of its embarrassing effects?

A group of dogs (some operated on as puppies, others as adult animals) have been followed up and studied at intervals up to four years.

The intrapleural pressure was found to become lower as time went on, which showed a loss of elastic recoil. This was true in the puppy and in the adult dog which had one lung removed.

On a moderate severe strain test, the animal operated upon as a puppy showed definite embarrassment but not the degree of exhaustion shown by the animal operated upon as an adult.

The anoxemia test shows that the cardiorespiratory reserve is cut in half by removal of 50 per cent

of pulmonary tissue, but that it will come back to from 75 to 80 per cent within twelve months in animals operated on as adults. Part of this return of function is lost after the animal grows older.

In dogs operated upon as puppies, there is definite evidence of hyperplasia of the lung, little evidence of emphysema, and little evidence of loss of elastic tissue. In dogs operated upon as adults a dilatation of the alveoli develops and there is evidence of the development of chronic emphysema as seen in the breaking of the alveolar walls, thickening and clubbing of their broken ends, collapse of the capillaries, and fragmentation of the elastic tissue.

These same findings might be applied to man. The remaining lung of the young may hypertrophy, but in the adult probably a compensatory emphysema develops. JULIAN A MOORE, M D

ESOPHAGUS AND MEDIASTINUM

Gagna, F, and Bassignana, D. Esophagotracheal Fistula Due to Carcinoma of the Esophagus (Fistola esofago tracheale da carcinoma esofageo). *Minerva med*, 1940, 31 344

The authors state that the statistics show that perforation of the esophagus caused by esophageal cancer is rather frequent and that esophagotracheal fistula predominates among the perforations involving both the esophagus and the respiratory tract. This is due to the anatomical relationship of the esophagus to the trachea and also to the frequency of occurrence of carcinoma at the bifurcation of the trachea, which is a site of physiological constriction. In most cases, there is a single, short fistula, but in some the fistulous tract is extensive. Usually, the orifice is small and more or less obturated by the tumor, it may be so narrow as to escape careful clinical and roentgenological investigation and may be discovered only at autopsy. In half of the cases, the presence of fistula is revealed by an acute respiratory crisis which may result in syncope followed by death, in other cases, the beginning is slow and insidious, being marked only by slight cough immediately after deglutition, a feeling of oppression, and, at times, some traces of blood in the sputum. Some patients can take small amounts of fluid without experiencing any disturbances, and others succeed in feeding themselves by assuming some particular posture or by taking a deep inspiration, closing the glottis, and then swallowing the food. Patients with esophagotracheal fistula are exposed not only to bronchopulmonary complications but also to progressive general debility from defective nutrition, gastrostomy may become necessary to feed the subject, but the prognosis is unfavorable. In 75 per cent of the cases, the patient dies from pulmonary complications within one month after the fistula has been established clinically.

The authors report a case in which the first symptoms of perforation occurred about three and one-half months after the appearance of esophageal disturbances due to cancer. In the beginning, the

symptoms were only suggestive, but later they became decisive. The suggestive signs included cough on deglutition accompanied by expectoration of ingested substances, frequent and copious eructations, and decrease in the strength of the voice due to decreased pressure in the trachea because air was escaping into the esophagus. The decisive signs were a blowing murmur synchronous with respiration, perceived at the end of sound introduced into the esophagus to the level of the obstruction, and the results of the roentgen examination which established the presence of the fistula. The latter examination is indispensable for the differential and etiological diagnosis of esophagotracheal perforation, but it is necessary to remember that the passage of opaque substance into the respiratory tract is insufficient to justify the acceptance of esophagotracheal fistula because various anatomical or functional disturbances of deglutition may enter into the picture. Highly located or marked stenosis of the esophagus favors the arrest or more or less rapid regurgitation of the opaque meal which may then easily pass into the larynx and the trachea and, if this occurs rapidly

may raise a doubt concerning the real route taken by the opaque substance to reach the bronchi. On the other hand, esophageal stenosis, which is usually associated with the fistula may help to establish the diagnosis because it indicates the exact site of the obstacle and of the communicating tract. The ease with which the fistula can be demonstrated will depend on the site and direction of the fistula as well as upon the degree and localization of the associated stenosis.

The examination must be started with the administration of small amounts of very fluid opaque substance followed by larger amounts of thicker but never solid meal. The tolerance of the patients for opaque substances, whether barium or bismuth salts, is usually good when the above-mentioned method is used. The importance of esophagocopy and of bronchoscopy when it is possible to use them, should not be overlooked because they may give positive diagnostic data in conjunction with the other symptoms. There were no grave bronchopulmonary complications during the entire course of the disease in the present case. RICHARD KERR, M.D.

GASTROJEJUNOCOLIC FISTULA

Collective Review

MAX BORNSTEIN, M D, F A C S, and LEO R. WEINSHEL, B S, M D,
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THE occurrence of gastrojejunocolic fistula after gastrojejunostomy is recognized as one of the most serious problems in modern gastric surgery. Of the late complications following gastrojejunostomy, none is more disappointing or feared than the development of jejunal ulcer which is the preceding lesion of gastrojejunocolic fistula. A review of the literature reveals that the average case of gastrojejunocolic fistula occurs between four and one-half and nine years following the gastro-enterostomy, while a few cases have been reported as early as six weeks following surgery and some, eighteen years later. We (M. B.) have had the opportunity of seeing a case of duodenal ulcer in 1919 at which time a partial gastrectomy was performed and followed by a posterior gastro-enterostomy. The patient had no difficulty following this surgical procedure until twenty-one years later. In January, 1940, an exploratory operation was performed, and the patient was found to have a gastrojejunocolic fistula. The subject of gastrojejunocolic fistula should be of interest to all of us, and in view of the fact that so few cases are reported in the literature, we have taken the liberty of briefly reviewing the incidence, etiological factors, pathology, symptomatology, diagnosis, and treatment of this condition.

The first gastro-enterostomy was performed by Wolfer (11) at the suggestion of his assistant, Nicoladini, as recently as the year 1881. Braun (78), in 1899, reported the first case of gastrojejunal ulcer. A point of interest here is that the first case of gastrojejunal ulcer to be reported was one in which acute perforation took place. Goepel (73) reported the first successful suture of acute perforation of gastrojejunal ulcer in 1902. The first case of gastrojejunocolic fistula following gastro-enterostomy was reported by Czerny (11) in 1903. A resection "en bloc" was made of the stomach, jejunum, and colon, and the gastro-enterostomy was successfully completed. In one of the earliest comprehensive papers on the subject, Paterson (56), in 1909, originated the term "gastrojejunal ulcer." In 1912, Haudeck (29)

made the first roentgen-ray diagnosis of gastrocolic fistula caused by a carcinoma of the stomach. Verbrugge (75), in 1924, collected 202 cases of gastrocolic and gastrojejunocolic fistulas from the literature after a most thorough review and added 14 new cases from the Mayo Clinic which were reported by Mayo and Rankin (49) in 1921, which made a total of 216 cases. Fardelmann (17), in 1937, made an additional review of the literature and stated that a total of 229 cases had been reported from 1903 to 1930. Since then, in so far as we have been able to ascertain, 92 cases have been reported by various authors. With the case we are reporting, a total of approximately 322 cases have been reported up to the present time.

INCIDENCE

It is difficult to determine the incidence of gastrojejunocolic fistula because it is known that many of the observed cases have not been reported or diagnosed, and it is readily admitted by those who have written on this subject that it is not possible to determine the frequency of gastrojejunal ulcer. It is interesting to observe that a gastrojejunocolic fistula practically never occurs in women and of 52 cases of fistula reported by Judd (32) in 1935, only 1 was that of a woman. Lahey (35) agrees with Judd and adds that women have lower acid values than men, and that fistula almost never occurs following gastro-enterostomy for carcinoma of the stomach. He further reports that the incidence of fistula communication with the colon in cases of gastrojejunal ulcer is 8.7 per cent. Balfour and Down (5) report the incidence of gastrojejunal ulcer with impending colic fistula in a series of 500 cases to be 3.26 per cent. Strauss, Block, and Friedman (70) report a 24 per cent incidence of gastrojejunal ulcer developing after gastro-enterostomy and state that 90 per cent of the ulcers are duodenal and 10 per cent are gastric in origin. This is quite suggestive in view of the high acid values in duodenal ulcer and the low values in gastric ulcer. Jordan (30) states that most cases of jejunal ulcer occur after gastro-enterostomy for gastric ulcer, but that they are almost unheard of after operation for carcinoma of the stomach, although Judd has re-

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ported a case. Lewinsohn (38) in 1925 published a series of 68 cases of gastro-enterostomy in which 23, or 34 per cent, of the patients developed gastrojejunal ulceration after having been watched for a period of not less than five years. Il ret and Stewart (29) give a 53 per cent incidence for 42 cases examined from nine months to nineteen years after the operation. These, however were selected cases, for the examinations were carried out after the patients had died and therefore no cognizance was taken of the patients who had recovered and who might constitute a higher percentage of the total number operated upon.

Verbrugghe (75) believes that fistulas due to carcinomas of the colon and stomach are decreasing whereas fistulas due to gastro-enterostomy are increasing. Most authors agree with Pratt (62) that jejunal ulcer following gastro-enterostomy practically always occurs in the group of patients whose original trouble was a duodenal rather than a gastric ulcer. The British Medical Association studied 744 cases for a period of from two to four years and reported an incidence of 2.8 per cent. The Germans report 5 per cent. Mayo and Rankin (49) report from 1 to 3 per cent. Paterson (37) reports .4 per cent in 495 cases. Lord Moynton (55) reports 1.6 per cent in 613 cases. Walton (78), in 1930 reported 616 gastro-enterostomies, of which 6 (2.6 per cent) were subsequently followed by gastrojejunal ulcer.

Most authors state that recurrence is more frequent after anterior gastro-enterostomy. However Walton (78) found 29 gastrojejunal ulcers in 1,313 posterior anastomoses, while in following up 33 patients with anterior gastro-enterostomy he found no marginal ulcers. Jordan (30) states that it seems evident, therefore, that the reported incidence of gastrojejunal ulcer will vary and depends upon such factors as the length of the follow-up period, the care with which patients are observed after the operation, the nature of the original lesion and the associated gastric phenomena, the race of the patient, the quality of the surgical technique and the presence of foci of infection or other etiological agents.

AGE AND SEX

The age in which fistulas occur is the age during which ulcers usually develop. The youngest patient reported by Roux (75) was twenty years of age and the oldest sixty-six years. The Mayo Clinic reports that the age incidence is between twenty-seven and sixty-one years, and that all of their patients were males but 1. Rife (65) re-

ports his youngest patient to be thirty-one and the oldest seventy-two, and that the development of definite symptoms of fistula varied from six months to eleven years with an average interval of four and one half years. It is interesting to note that of his 13 patients with fistula following gastrojejunal ulcer 2 were women—an incidence of about 15 per cent. Eusterman (15) states that the proportion of males to females affected with gastric and duodenal ulcers is 3 to 1 and the proportion affected with jejunal ulcers is 6 to 1.

ETIOLOGY

Gastrojejunal ulcer has been named as the primary etiological factor in gastrojejunocolic fistula. The original lesion in most instances is a duodenal ulcer. Among the many theories which have been advanced as the cause for the development of gastrojejunal ulcer are (a) focal infection (trauma, tuberculosis, syphilis) (b) marked hyperacidity which causes the alteration in physiology brought about by the contact of an acid medium with the jejunum which is accustomed to an alkaline medium (Mann and Williamson, 45) (c) operative trauma to the mucosa by the use of anastomotic clamps which cause pressure, (d) use of non-absorbable sutures and Murphy buttons. (The substitution of absorbable catgut ligatures for silk sutures failed to prevent the condition) (e) foreign body lodgments, such as suture material in the line of sutures, which cause devitalization of the suture line (Balfour 4) although Labrey and Swinton (37) do not believe that non-absorbable suture material is responsible for the production of anastomotic ulcer (f) indigestion in diet too soon after an operation (g) carelessness in medical supervision (h) excessive smoking, alcoholism, and the use of condiments (i) fatigue or exposure (j) arteriosclerosis (k) breaking down of benign tumors (l) faulty technique—particularly placing the anastomosis too high, the posterior anastomosis being made too low through the opening in the mesenteric leaf of the transverse colon (the opening should be high, but not impair the blood supply) (the colon the completed anastomosis should be kept away from, and should not rest on the transverse colon) (18) (m) resection after gastro-enterostomy which is prone to be followed gain by ulcer (particularly after von Eiselsberg pyloric exclusion operation) and (n) the same causes that produced the original ulcer.

PATHOLOGY

Fistulas, in cases of carcinoma of the stomach or colon are part of the tumor itself, and the

tract is lined with cancerous cells, the size, shape, direction, and number of which vary with the tumor. The fistulas resulting either from a jejunal or peptic ulcer correspond to a fairly well defined type. They may be gastrocolic, jejunocolic, or gastrojejunocolic. There is usually localized peritoneal reaction, and there may or may not be extensive adhesion formation. Fistulas are single, almost without exception although cases of multiple jejunal ulcers have been reported. The direction, length, and width of the fistulas are variable. The orifice may be hidden in the folds of the mucosa, which creates a valve-like apparatus that causes regurgitation from the colon to the jejunum, and thus gives rise to symptoms of undigested food in the fecal material and eructations of a foul nature. The mucous membrane of the fistulous tract is usually not markedly abnormal. The surface has a smooth, glistening appearance and the glands are regularly disposed. There is usually no ulceration of the mucous membrane. The edges on the intestinal side are smooth, those on the colon side may be slightly indurated (75).

SYMPTOMS

The onset of the symptoms of fistula varies because the period of evolution of gastrojejunocolic fistula is preceded by the symptoms of the associated lesion. Preceding the period of formation of a fistula there is usually an interval of several years during which time an ulcer develops, followed by a subsequent gastro-enterostomy for the relief of the ulcer symptoms. Eventually, a jejunal ulcer may form and, finally, a fistula. Balfour (4) reported that in 56.7 per cent of the cases of gastrojejunal ulcer the symptoms reappeared in one year, although in 1 case the post-operative interval was twelve years. The average length of time between the primary operation and the development of gastrojejunal ulcer was four and one-half years. Lahey (37) reported a case in which a gastrojejunal ulcer and its associated symptoms appeared nineteen years after operation on a duodenal ulcer.

Diarrhea The most constant and significant symptom of fistula is frequent defecation. The stools may be watery, semi-solid, fatty, or henteric. The patient may have from six to ten yellow, soft stools daily with a strong foul odor. The stools are usually acid in reaction because of either gastric secretions or fatty acid. The diarrhea does not respond to any medication although it may be alleviated by the use of a high residue diet. Because of this constant diarrhea the patient suffers from a loss of general good health,

and marked emaciation of the patient ensues. Many authors (18, 65, 75) believe that the persistent diarrhea is caused by the passing of undigested food through the stomach into the transverse colon.

Eructation The belching of gas with fecal odors occurs in most cases. The fecal odor is extremely disagreeable to the patient even though it may not be noticed by others. Enemas or the injection of air into the rectum for diagnostic purposes aggravates the condition. Some patients can taste medicine which has been instilled rectally. The eructations usually disappear only to recur with the next episode of diarrhea.

Vomiting It is not common to find vomiting in these patients and it is unusual to find actual fecal vomiting. Vomiting is increased by large enemas and decreased by frequent gastric lavage and by the administration of a constipating diet. In the absence of intestinal obstruction vomiting of fecal material is pathognomonic of the disease.

Pain This symptom is rare and not dependable and the site of the pain is variable. Eusterman (15) states that in 85 per cent of the cases the pain may be farther to the left and lower than the original pain. It may be sharp and burning, usually it is circumscribed or in the left iliac region, but, as a rule, there is very little pain present. If there is an associated intestinal obstruction there may be severe pain. If a gastrojejunal ulcer exists and is about to perforate there is usually severe pain, but with the establishment of a fistula, pain often ceases.

Loss of weight The loss of weight is very marked and is quite rapid in spite of unimpaired or increased appetite and intake of food. Patients usually become emaciated, dehydrated, and weak, and thereby increase the surgical risk. Occasionally an associated nutritional edema of considerable severity may exist. Cachexia with weakness and weight loss can usually be found in over 90 per cent of the patients, according to Poynton and MacGregor (61).

Physical findings The physical signs are never constant in their appearance. On examination, the greatest tenderness and rigidity may be found in the left lower quadrant of the abdomen because if fluid escapes from a perforation of a gastrojejunal ulcer it usually passes downward at the left of the vertebral column. A mass is seldom felt on abdominal palpation and if one is present it is usually due to extensive adhesions or regional inflammation. It is difficult to determine by physical examination whether one is dealing with a large or small fistula. It is known that when a large fistula exists, diarrhea occurs soon after

the ingestion of food. If a small fistula exists and communicates with a distant segment of bowel then the cardinal symptoms are intermittent for the fistulous tract may close for a time and allow normal bowel movements, only to be reopened and cause a reappearance of the symptoms. Active peristalsis may be present.

DIAGNOSIS

The diagnosis of gastrojejunocolic fistula is usually based on a history of ulcer symptoms followed by gastro-enterostomy from which the patient obtains relief for a period varying from one week to ten years but usually from six to twelve months. This is followed by a period of intermittent diarrhea associated with fecal-smelling eructations and, finally, marked wasting, emaciation, cachexia, and dehydration. Undigested food may be found in the stool very soon after ingestion if the fistulous tract is large. No medication which is instilled rectally may be tasted soon after instillation. Similarly meals colored by dye such as carmine or charcoal, may appear in the stool and colored enemata may be recovered by gastric lavage.

Röntgenological examination (3, 10, 25, 41, 43, 66, 79) is another aid in establishing the presence of a fistulous communication between the stomach, jejunum, and colon. If barium can be seen to enter the colon shortly after escaping from the stomach the diagnosis of gastrojejunocolic or gastroscolic fistula can be made with certainty.

DIFFERENTIAL DIAGNOSIS

The principal pathological conditions which must be considered in differential diagnosis are intestinal obstruction and acute peritonitis.

The symptoms of acute obstruction are (a) sudden abdominal pain, at first paroxysmal but later continuous (b) constipation, soon becoming absolute (c) vomiting, persistent, and ultimately of stercoraceous character (d) abdominal distention (e) visible peristaltic waves (f) collapse indicated by pinched features, sunken eyes, a cold clammy skin and frequent, feeble pulse and (g) toxemia characterized by decrease in the chlorides of the blood and a decrease in the carbon-dioxide combining power of the blood and an increase of the blood urea. Röntgenograms will reveal the condition.

Peritonitis is characterized by (a) intense abdominal pain and tenderness (b) shallow and thoracic breathing (c) the position of the patient—to relieve the tension of the abdominal muscles he lies motionless upon his back with the legs and thighs flexed (d) pinched features and

anxious expression (e) a distended abdomen with rigid walls (f) dullness in the flanks upon percussion (g) usually a moderately high temperature from 102 to 103 Fahrenheit (h) vomiting and hiccough (these are common symptoms) and (i) a high leucocyte count, from 15,000 to 50,000. Collapse may occur.

PROGNOSIS

The outcome of a gastrojejunocolic fistula is usually fatal unless surgery intervenes. It has been reported that recurrences of jejunal ulcer occur in from 4 to 60 per cent of the cases and, thus, it is no wonder that such an experienced operator as Lahey wrote: "I approach gastrojejunocolic ulcer with colonic fistula with hesitation and fear as to the question of possible fatality."

THE PREVENTION OF GASTROJEJUNAL ULCER AND RECURRENT GASTROJEJUNAL ULCER

Jordan (30) believes that prevention of gastrojejunocolic ulcer and recurrent gastrojejunocolic ulcer is likely to be unsatisfactory until we determine the ultimate causative factors of the ulcer and establish effective curative and preventive treatment based upon knowledge of the etiology or pathogenesis. Lacking such important knowledge the surgeon today would gain tremendously if it were possible to decide in advance which patients will develop gastrojejunocolic ulceration after gastro-enterostomy. Much work along these lines has been done but it must be admitted that our knowledge is still incomplete and quite inadequate.

Toland and Thompson (73) believe that until the problem of the etiology of primary peptic ulcer is solved, it is not likely that the cause of secondary gastrojejunocolic ulcer will be found. Despite our lack of knowledge as to the direct or ultimate cause of gastrojejunocolic ulcer a few important facts stand out. One is the peculiar susceptibility of the jejunum (the tissue susceptibility factor of Ochsner and his coworkers, (54) and the influence of gastric juice. The other is the marked tendency of gastrojejunocolic ulcer to penetrate or perforate. The latter is attested to by the high frequency of subacute perforation of the gastrojejunocolic ulcer and by the frequent occurrence of gastrojejunocolic fistula. Lahey and Sinton (37) believe that gastrojejunocolic fistula with its high mortality is anatomically less apt to occur after anterior gastro-enterostomy than after posterior gastro-enterostomy and should gastrojejunocolic ulcer occur after anterior gastro-enterostomy it could be definitely easier and safer to manage it surgically from a technical

point of view than gastrojejunal ulcer following posterior gastro-enterostomy

TREATMENT

Surgical intervention offers the only hope and is the treatment of choice for this condition. The patient, as a rule, however, is a very poor surgical risk. Usually he is dehydrated, emaciated, and anemic. Surgical shock, hemorrhage, peritonitis, or infections of the respiratory tract are the chief dangers. The object of all treatment, whether it be medical or surgical, is to restore the patient's normal physiological balance and to preserve as far as possible his designed anatomical conformation in order to bring back normal health.

One must remember that abdominal surgery involves a great deal of danger because of the possibility that severe peritonitis may follow surgical procedures, and when the gastrojejunal ulcer is complicated by a fistulous tract leading to the colon the surgical work is increased and the dangers of peritonitis from fecal contamination are very great. Cushing, as reported by Findlay (18), has shown that gastric and duodenal contents are relatively sterile and that bacteria increase in number and virulence down the intestinal tract. It is well known that peritonitis from the spill of normal gastric or duodenal contents is rare, while the slightest contamination of the abdominal cavity by the contents of the large intestines results in peritonitis which is usually fatal to debilitated patients.

Operative procedures should be as simple as possible and certainly no routine operation can be performed equally well for all fistulas. The simple closure of the fistula and the undoing of the gastro-enterostomy with the creation of a new gastro-enterostomy has given the best results. In some cases, if a marked stricture has taken place, resection of the colon is necessary. Graham and Lewis (27) believe that the ideal operation for a gastrojejunocolic fistula is a block resection of the stomach, jejunum, and colon with triple anastomoses, together with cecostomy. Balfour and Down (5) state that their experience has shown that the gastrojejunal ulceration can be excised and the anastomosis disconnected with a mortality rate of 1 or 2 per cent, or if partial gastrectomy also appears to be indicated, the mortality rate will be 4 or 5 per cent. According to Lewisohn (38), it is assumed by many surgeons that pylorotomy will prevent the formation of gastrojejunal ulcers. This opinion, which is often expressed in the literature, is erroneous. Gastric resection should never consist in simple pylorotomy. Only partial or subtotal gastrectomy will

reduce the incidence of postoperative gastrojejunal or jejunal ulcers to a minimum. Jordan (30) believes that the incidence of recurrent gastrojejunal ulcer after partial gastrectomy is low, probably about 0.5 per cent, but it is important to know that it does occur and that the mere recovery of the patient from the operation does not always mean a successful future. Partial gastrectomy, therefore, may be considered the best of the available methods of surgical treatment, but it cannot be accepted as final or a wholly satisfying solution. Among the sequelae of partial gastrectomy may be mentioned anemia, gastro-intestinal motor disturbances, nutritional impairment, and a hypoglycemic state.

According to Lowey's statistics on 63 operations of all kinds, there were cures in 61.9 per cent, recurrences in 11.1 per cent and deaths in 27 per cent. Lahey (37) reports a 15 per cent mortality. At the Mayo Clinic (49) operations were performed in 20 of a series of cases, in 4 partial resection of the transverse colon was done, in 15 the fistula was closed, in 11 the old gastro-enterostomy was cut off, in 4 a new one was made, in 2 the old gastro-enterostomy was reestablished, in 3 partial resection of the jejunum was performed, in 2 pyloroplasty was performed, and in 1 jejunostomy and cecostomy were done. There was a mortality rate of 20 per cent, 2 patients dying after resection of the colon for carcinoma, 1 dying from acute nephritis two years after the operation, 1 from general peritonitis and bronchial pneumonia and 1 from an indefinite cause.

Findlay (18) has used the Mikulicz operative procedure in selected cases with good results. Lahey and Swinton (37) have a two-stage operation which appears to be an ideal procedure for gastrojejunocolic fistula but it is a procedure of too great magnitude to be routinely applicable to this condition with a reasonable mortality.

The importance of pre-operative treatment cannot be overemphasized in patients who are to undergo major gastric surgery. The water balance must be reestablished, the acidosis must be combated with dextrose and intravenous solutions, transfusion of whole blood may be necessary, and the ingestion of large quantities of fruit juices and carbohydrates, along with the administration of minerals and vitamins is essential. All these procedures are necessary so as to return the patient to as normal a condition as possible. Post-operative care is likewise important. The patient should be placed on a strict diet following surgery whether it be partial gastrectomy or gastro-enterostomy. Alcohol, tobacco, and condiments must be avoided. The proper administration of

alkalies is important. There should be moderation in habits and in living and, finally these patients should be observed carefully so that any recurrence of ulceration may be detected.

CONCLUSION

A collective review of the literature revealed that 322 cases of gastrojejunocolic fistula have been reported since 1893. The interval between gastro-enterostomy and the development of gastrojejunocolic fistula varied considerably, the shortest being six weeks and the longest eighteen years. We had a case in which gastrojejunocolic fistula occurred twenty-one years following a gastro-enterostomy for duodenal ulcer. The etiology, pathology, symptomatology, differential diagnosis, and treatment are discussed. No definite surgical procedure is favored, but it has been found that partial gastrectomy followed by excision of the fistula, taking down of the old gastro-enterostomy and then reconstruction of the gastro-intestinal tract is the operation which has given the best results to date and should be replaced by more simple methods only if the condition of the patient will not warrant its use. The evolution of the fistula is progressive, and unless surgical intervention is undertaken, the outcome is usually fatal.

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SURGERY OF THE ABDOMEN

GASTRO-INTESTINAL TRACT

Gray, H. K., and Skinner I. C. *The Operative Treatment of Cardiospasm.* *J. Thoracic Surg.* 949, 20.

Cardiospasm is the term most frequently used to imply spasm of the musculature of the cardia or epicardia sufficient to prevent completely or partially the passage of food from the esophagus into the stomach.

The etiology of cardiospasm is still in dispute. The disease has been attributed to primary atony of the musculature of the esophagus, to spasm of the cardia, to failure of proper relaxation of the cardiac sphincter, to spasm of the diaphragm, to pressure on the esophagus by the left lobe of the liver to kinking of the esophagus, to pressure from the lower lobes of the lungs, to fibrosis of the periesophageal connective tissue, and other conditions. Recent pathological and experimental work has made the theory of autonomic imbalance the most acceptable one.

A study of the gross pathological changes of the esophagus produced by cardiospasm demonstrates why in all cases the condition is not amenable to simple dilatation. The characteristic gross pathological changes seen are dilatation of the esophagus, hypertrophy of its wall, and actual lengthening of the organ with resultant tortuosity. The dilatation usually assumes one of three typical shapes: fusiform, flask-shaped, or sigmoid-shaped. In the fusiform variety the lumen of the esophagus increases to about midway between the cricoid cartilage and cardia, then gradually decreases in size. In the flask-shaped type the dilatation is immediately above the cardia. In both of these varieties the cardia is the most dependent portion of the dilated esophagus and both are readily relieved by dilatation from above.

The sigmoid-shaped esophagus represents an advanced pathological change and, fortunately, is the rarest type.

The symptoms of cardiospasm are characteristic of the stage of the disease. There are three stages, more or less clearly defined, in the clinical course of the disease: (1) cardiospasm without regurgitation of food; (2) cardiospasm with immediate regurgitation of food; and (3) cardiospasm with dilated esophagus and retention of food in the dilated part—this undigested food is regurgitated at varying intervals. The characteristic symptoms are dysphagia, regurgitation, and epigastric pain. Respiratory disease may result from inspiration of the contents of the esophagus. Dysphagia is usually of long duration and is as marked for liquid as for solid foods. Regurgitation may occur immediately after meals or may be delayed for hours; this depends on the amount of food taken, the degree of dilatation, and

the tone of the esophagus. Nocturnal regurgitation is a particularly disturbing feature. Epigastric and substernal pain may precede the appearance of dysphagia by many months and must be differentiated from that caused by disease of the biliary tract, angina pectoris, peptic ulcer and para-esophageal hernia.

Dilatation of the cardia from above by some type of mechanical dilator is an extremely satisfactory method of treatment in most cases of cardiospasm. Of more than 200 cases of cardiospasm in which the patients were encountered at the May Clinic, only 7 were treated by operative measures. Esophagegastrotomy seems to be a very satisfactory operation in certain cases in which cardiospasm is resistant to treatment by dilatation.

For the debilitated patient, preliminary gastrotomy or jejunostomy has been recommended for feeding purposes prior to the more extensive operation. At other times it is feasible to perform gastrotomy at the time of the major procedure, and thus avoid the increased difficulties of separating adhesions and the necessity of performing two operations. Satisfactory exposure can be obtained through a left rectus incision which begins in the left costo-umbilical angle and extends a little beyond the umbilicus. If necessary the left lobe of the liver can be mobilized easily by severing of the left lateral ligament and it can then be completely packed away to the right beneath the abdominal wall. The spleen is retracted down and to the left by a large, specially designed retractor. It is probable that preliminary interruption of the left phrenic nerve as in cases of diaphragmatic hernia could facilitate the operation, although the authors could find no report in the literature in which this had been done.

When satisfactory exposure has been obtained, the stomach is drawn down by means of a right angled rubber-covered clamp, and the abdominal portion of the esophagus which is covered with peritoneum is brought into view. The peritoneum is divided at the point where it is reflected from the diaphragm onto the esophagus. Vessels running along the anterior margin of the hiatus should be avoided. A finger is introduced into the mediastinum and as much of the thoracic portion of the esophagus as possible is mobilized. To accomplish this, the esophageal hiatus may be split a short distance to the left. The finger is then hooked around the freed esophagus and the latter is drawn down into the abdomen as far as possible. There is rarely difficulty in obtaining sufficient length of esophagus, particularly when the esophagus has assumed the sigmoid shape as the organ usually has become lengthened as a result of the disease. The esophageal hiatus is stitched high along the esophagus by interrupted silk sutures to prevent retraction of the

anastomosis into the thorax and to lessen the likelihood of soiling the mediastinum at the time of the anastomosis. The anterior portion of the fundus of the stomach is anastomosed to the redundant esophagus as in gastro enterostomy. The incision in the esophagus may be extended in an arc through the cardia and the union accomplished in the manner of a Finney pyloroplasty. The left lobe of the liver falls into place over the suture line and adds to its security. A drain may be placed down to the anastomosis if there is fear of contamination.

The nerve supply of the cardia has been attacked by several operative procedures in an attempt to relieve cardiospasm.

In the opinion of the authors, surgical procedures will be found necessary at times in those few cases in which the esophagus is markedly dilated, tortuous, and lengthened with angulation at the cardia, and in which development of a reservoir below the level of the opening of the cardia has occurred.

Agati, D. Roentgen Aspects of Gastrogastric and Gastroduodenal Invagination (Quadri radiologici di invaginazione gastro gastrica e gastro-duodenale) *Radiol med*, 1940, 27 865

Pure gastrogastric invagination is extremely rare and may be ascending or descending, the first being more frequent than the second, in fact, the Italian literature mentions 5 cases of the former, 3 of which are questioned, and only 1 case of the latter. It would seem that the determining factor of the ascending form is the presence of organic lesions in the antral region, especially annular neoplastic infiltration, while that of the descending form is the presence of endogastric tumor, usually a polyp. Gastroduodenal invagination is more frequent and is due to a benign tumor which is usually located near the pylorus and, under the influence of peristalsis, forces the pyloric ring and penetrates more or less deeply into the duodenum, pulling with it the gastric wall on which it is implanted.

Agati reports 3 personal cases. The roentgen findings of the first case differ from those described by other authors. The latter observed a shortening of the gastric shadow, which is cut off by a filling defect presenting a picture of pincers with a distal concavity for the ascending form and a proximal concavity for the descending form and with evidence of the lumen of the invaginated portion. In the author's case, there is a filling defect with two pictures of pincers, one limiting the lower part of the gastric body and opening distally, and the other limiting the upper part of the antrum and opening proximally, the two concave defects do not correspond exactly in the vertical sense, as the lower branch of the pincers of the gastric body is introduced in the concavity of the antrum, while a trace of opaque substance leaves the center of the concavity of the gastric body to run toward the antrum and disappear in the opacity of the latter. This picture is interpreted as that of an ascending gastrogastric invagination, altered by perigastric proc-

esses, it gives the impression that the two concave pictures are encased one into the other as if there were a double, an ascending and a descending, invagination.

In the second case, the invagination is short because the concavity opening distally and limiting the gastric body is little marked and has a large radius, its lower branch ends with a pseudodiverticular sac. In the center of the pincers, there is a large pedicle corresponding to the invaginated part which is kept distended by the polyp that fills the entire antropyloric portion. The diagnosis of ascending gastrogastric invagination was confirmed at operation.

The third case is one of gastroduodenal invagination. The characteristic finding is the presence of an oval defect involving the bulb and having irregular borders. The immediately prepyloric portion always appears spastic and projects the picture of its folds on the bulbar defect, but the picture, which is quite abnormal and has an areolar aspect, suggests a juxtapyloric polypous gastritis which is probably the cause of the invagination. In the presence of such bulbar defects, the differential diagnosis must take into consideration the well known aspects produced by the pyloric eminence in the duodenum (defect on the pyloric side with transparent dome, rosette, and cloverleaf pictures), especially if taken in profile, in which case a tumoral defect, the frontal appearance of a niche, or an invagination may be simulated.

The diagnosis of the first and third cases is presented as one of probability, as neither case has been submitted to operation. **RICHARD KEMEL, M D**

Chaffin, L. Surgical Emergencies During Childhood Caused by Meckel's Diverticulum *Ann Surg*, 1941, 113 47

Meckel's diverticulum represents a remnant of the omphalomesenteric duct. Generally, the structure has vanished by the time of birth, but whenever it persists, it becomes a menace to health.

The term "duplex ileum" is applicable to a large intramesenteric diverticulum. A true diverticulum represents a continuation of the intestine, and its walls contain the same histological structures as those of the intestine. A false diverticulum, on the contrary, does not possess a muscular coat.

Complications of this vestigial structure include hemorrhage, ulceration, perforation, peritonitis, intussusception, volvulus, intestinal obstruction, umbilical sinus, and umbilical fecal fistula. Gangrene in one instance occurred during intra-uterine life, causing so called "meconium peritonitis."

Heterotopic gastric mucosa is often found in these diverticula and may give rise to ulceration, which in turn may cause hemorrhage, perforation, and peritonitis. Ulceration has also been observed in diverticula when no trace of gastric mucosal histology was demonstrable.

Meckel's diverticula have been found among the contents of hernial sacs. So variable are the complications that every preliminary diagnosis of an ab-

dominal emergency in children should take into account a persistent diverticulum as a basic factor and at the time of operation exploration should always establish the presence or absence of the structure. Most significant among the subject's symptoms are pain, nausea and vomiting, sometimes constipation, but more often small evacuations containing blood. The blood count is helpful only when integrated with the facts gathered from the history and physical examination. Roentgenography has very limited usefulness.

Among 19 cases in this series there were 7 deaths, mortality of about 37 per cent. The youngest patient was a newborn infant, the oldest a child of eight years. Inversion of the tumor with purse string suture, which was responsible for fatality, is a hazardous procedure in children, because the subsequent edema may completely block the lumen of the intestine. *HAROLD LAURIE, M.D.*

Belberg, W. Carcinoid of the Bowel (Ueber das Carcinoid des Darmes). *Arch f. path. Anat.*, 940, 306, 467.

Carcinoids, which are usually benign tumors arising from the chromaffine cells in the intestine, have been differentiated from malignant growths since 1907 and have been frequently described from the pathological aspect but rarely from the clinical. The author has seen 33 cases in 4,000 autopsies and operative specimens during the past six years (Carcinoids of the appendix are not included.) In this series, there were 33 carcinoids in the small bowel, in the cecum and in the rectum. Ten of the tumors had metastasized. Several characteristic histories are presented, and the findings compared with those in the literature.

The average age of the patients is sixty-six years and the carcinoids are found in 6 per cent of those over fifty years old and in 0.1 per cent of those under fifty. The incidence is the same in the two sexes. The tumors are most often found in the lower small intestine, and are frequently multiple. Clinical manifestations are produced only by the malignant carcinoids and the very large benign ones. They may either become large enough to materially narrow the lumen or smaller pedunculated ones may lead to intussusception. The infiltrating, proliferating type may cause contractions and stenosis. Malignant carcinoids are the most common malignant tumors of the small bowel, where malignant tumors, in general, are very rare. They differ favorably, however, in growth and malignancy from carcinomas and sarcomas. The primary tumor is often small, and metastases are found in the mesentery, lymph nodes, liver and, relatively frequently, in the spleen.

As to their etiology, Feyrter found a substance in carcinoids and in chromaffine cells which affects the blood pressure and blood sugar and, therefore, he ascribes the origin of carcinoids to general disturbance of the internal secretions. The author was unable to confirm this. He found, as the only pre-

disposing factor, tumor tendency. Inasmuch as carcinoids grow so slowly, resection of the primary growth may, in spite of metastases, prolong life in most cases for years, as is indicated in several of the case histories presented by the author.

(BRYAN) LEO M. ZWISLOCK, M.D.

Garlock, J. H. The Surgical Treatment of Intractable Ulcerative Colitis. *J. Surg.* 94, 312.

Between 20 and 30 per cent of the patients with ulcerative colitis resist every form of medical treatment, the condition progressing to irreparable involvement of the colon. The surgical treatment in the past consisted of appendicectomy, colectomy and, occasionally, colostomy. These procedures do not completely divert the fecal stream from the diseased bowel.

It is now agreed that surgical treatment is indicated under the following conditions: (1) uncontrollable hemorrhage, (2) acute ulcerative colitis with profound toxemia, (3) impending perforation, (4) chronic colitis resisting all forms of medical therapy, and (5) segmental ulcerative colitis.

Early performance of ileostomy when these conditions are present is life-saving measure. Ileostomy is to be considered as the first step of a graded multiple-stage operation involving subtotal resection of the colon. When segmental colitis is present, the plan of procedure will depend upon the general condition of the patient and the site of involvement of the colon. In such cases, when the left colon and rectum are involved, transverse colostomy must be seriously considered in preference to ileostomy. This is followed at a later date by removal of the diseased left colon. If the rectum is free of disease, an ileoproctostomy with transection of the ileum and colon proximal to the site of the disease, is the preliminary procedure of choice. If the right colon is involved, an ileosigmoidostomy with transection of the colon proximal to the anastomosis is performed.

In performance of an ileostomy the colon should not be touched. Many of the reported deaths after ileostomy may be attributed to ill-advised exploration of the colon. The author's opinion: Ileostomy should in no sense be considered a curative operation. Active disease may still be present in the colon eighteen months after its excision by ileostomy. Reestablishment of continuity of the ileum is fraught with great danger. It is wise to defer resection of the colon until the maximum improvement has been obtained, usually from six to eleven months.

If proctoscopic examination reveals normal rectum and lower sigmoid, anastomosis between the ileum and the anterior wall of the rectum should be done. When dealing with bowel of an ulcerative colitis case, no blind end should be dropped into the abdomen; the divided ends should be implanted into one angle of the incision as a colostomy opening. The next stage, which is carried out after two or three months' rest of removal of the sigmoid, descending colon, splenic flexure and left half of the transverse colon. The final stage consists of removal

of the terminal ileal fistula and the remainder of the colon

The author believes that unless the rectum is hopelessly diseased by pseudopolypoid degeneration, or by the presence of numerous fistulas, it will eventually heal and permit restoration of normal elimination. Thus, the rectum is not removed by abdominoperineal resection, which preserves that organ for possible future use in the reestablishment of intestinal continuity.

Fifteen of 25 surgically tested patients had ileostomies. There were 5 deaths in the series of 25 patients, a gross mortality of 20 per cent. In 4 instances an error of technique or judgment was responsible for the mortality, but with increasing experience the author believes that such errors will become less frequent. HAROLD LAUFMAN, M.D.

De Moraes, V. *Cancer of the Rectum* (Sobre cancro do recto) *Arq. de patol.*, 1940, 12: 221

De Moraes states that cancer of the rectum includes any malignant tumor of this organ, whether of epithelial or connective tissue origin. Rectal carcinoma occurs frequently, constituting 5 per cent of all carcinomas observed, while rectal sarcoma is rather rare. Various etiological factors have been incriminated for the appearance of rectal cancer, but without real proof, however, there is a lesion which often precedes the cancer—rectal polyposis. Usually, the carcinoma starts as a single, small nodule in the mucosa which soon becomes ulcerated. There are 3 clinical and anatomicopathological types of rectal carcinoma: supra-ampullar, ampullar, and anal, according to whether they occur in the upper portions of the rectum or in the anal canal, there are two principal forms: cylindrical celled, including adenocarcinoma, and solid and colloid carcinomas, and stratified celled, including planocellular, basocellular, and mixed carcinomas. The tumor remains localized to the rectum for a considerable time and then invades the neighboring tissues and organs. Early diagnosis is necessary for efficacious treatment. Unfortunately, rectal cancer is one of those diseases which are characterized by a prolonged period of latency during which no important symptoms reveal the disorder. Therefore, the physician must be familiar with the slightest initial symptoms, such as the appearance of a nodule in the rectal mucosa, a change in the intestinal functions, pain after evacuation, hemorrhage, discharge of mucus, obstipation, and dyspepsia. The diagnosis is confirmed by digital examination of the rectum, rectoscopy, roentgen examination, and biopsy. The patient often consults the physician when the disorder has evolved for several months, and a differential diagnosis must then be made between carcinoma and various other rectal diseases (hemorrhoids, prolapse, rectitis, stricture, syphilis, tuberculosis, Nicholas-Favre's disease, benign tumors, angioma, lymphangioma, adenoma, fibroma, polyp, and papilloma). The complications of rectal carcinoma are caused by its continuous growth, which results in subocclusion

of the rectum and destructive invasion of the nearby organs.

When the cancer is generalized and metastases have invaded the internal organs, bones, and skin, treatment is useless and is limited to relieving the sufferings of the patient. When the disorder is still localized, surgical intervention and irradiations are used. The object of surgery is the removal of all cancerous tissue. There are three routes to reach and extirpate the rectum: low (perineal, sacral, perineosacral, vaginal and anal), combined (abdominoperineal, perineo abdominal and abdominosacral), and high (abdominal). Pre operative preparation is indispensable to increase the resistance of the patient: several successive blood transfusions of from 200 to 400 c.c., injections of serum, and physiological salt and dextrose solutions, cardiac tonics, coagulants when indicated, special diet, attention to bowels, vaccinations, disinfection, and care of the mouth. General anesthesia with ether and spinal anesthesia are used, local anesthesia is impractical.

It may be necessary to install an iliac anus, its advantages and disadvantages are discussed. Its technique includes three steps: opening of the abdominal cavity, exposure and fixation of a sigmoid loop, suture of the abdominal wall and opening of the sigmoid.

As an introduction to the discussion of the various surgical interventions in use, the author gives a thorough description of the anatomy of the rectum. Among the low routes of access to the rectum, the perineal requires (1) incision of the skin around the anus and liberation of the rectum, including the fatty tissue which surrounds it, up to the peritoneum, (2) opening of the peritoneum and exteriorization of the rectum by pulling the pelvic colon down to the wound, and (3) closure of the peritoneum, partial reconstruction of the perineum, and section of the intestine and its fixation to the skin. The sacral route requires (1) incision of the soft tissues and sufficient bone resection to allow reaching the rectum, (2) liberation of the rectum and pulling down of the colon, and (3) resection and anastomosis of the intestine, and suture of the soft parts. Various modifications of this technique may be advisable, such as temporary bone resection, formation of a sacral anus, amputation of the rectum (perineosacral route). The vaginal and the anal routes have been used in a few cases.

The advantages of preserving the sphincter with its innervation are evident, when this seems possible, the sacral route must be used. However, the importance of preserving the sphincter should not be exaggerated. When an artificial anus is necessary, the perineal type is the best.

Among the combined routes of access to the rectum, the abdominoperineal and its reverse, the perineo abdominal, require two stages. The abdominal stage includes (1) laparotomy and exploration of the abdomen, (2) liberation of the pelvic colon and its mesentery and of the rectum, and (3) pulling down of the colon, penterization of the pelvis and

closure of the abdomen. The perineal stage includes (1) incision of the skin and cellular tissue up to the muscles (2) section of the muscles and liberation of the rectum (3) pulling down of the colon to the perineum and suture of the skin. A modification of the abdominoperineal method includes hysterectomy, section of the broad ligaments and dissection of the uterus and liberation of the anterior and lateral aspects of the vagina which are done before the rectum is attended to during the abdominal stage, the uterus being removed during the perineal stage. The abdominosacral route is simply combination of the abdominal and sacral stages of the previous interventions. The bdomino anal and the bdominovaginal routes have been abandoned.

The bdominal route requires (1) laparotomy and exploration (2) incision of the peritoneum and liberation of the rectum (3) section of the intestine below the tumor with closure and peritonization of the lower stump and (4) creation of an iliac anus above the extirpated tumor and closure of the abdomen.

The postoperative cure and the treatment of recurrences are the usual ones.

Irradiation has secondary value and plays secondary part in the treatment of cancer of the rectum, because radium and roentgen rays alone cannot cure the disorder even in its beginning when it presents only a small lesion. It is well known that tumors of highly differentiated cells are radioresistant, while those of undifferentiated cells are radiosensitive. Application of this knowledge to the tumors classified according to Broders scale shows that those of Grade I are radioresistant, of Grade II less radioresistant, of Grade III slightly radiosensitive, and of Grade IV radiosensitive. The critical use of irradiation causes decrease in the size of the tumor and in the pain, and arrests hemorrhage, mucopurulent discharge, and even the evolution of the tumor. Some tumors considered inoperable at first may be so improved by irradiation as to become operable subsequently. Most radiologists recommend pre-operative irradiation and it may be disadvantageous to install an iliac anus one or two weeks before the irradiations. Radium has seldom used before operation, but often used in an attempt to cure small lesions and as a palliative measure. It is applied at a distance (telecurietherapy) and on the surface and inside of the tumor. Roentgen irradiation is also a palliative procedure. It is used in inoperable cases, pre-operatively and postoperatively. The methods of Coutard, Holfelder and Chacal are recommended. Other palliative measures are discussed.

Only a few dozen cases of sarcoma of the rectum have been reported. Usually they were seen in the inoperable stage. The treatment of carcinoma applies to them.

The author discusses the conditions of operability which depend on the tumor and on the general condition of the patient, and also the practical aspects of the proposed methods of anesthesia (he prefers

general anesthesia with ether) and of the surgical interventions. The natural routes can be used only for small tumors in the anal canal and the lower portion of the rectum. The perineal route gives ample access and rivals the combined routes but when the sphincter is to be preserved the sacral route is better. In spite of their greater gravity the combined routes are preferred by many surgeons. The abdominal route has few adherents, it prevails because of its high mortality. In inoperable cases, iliac anus may give survival of two, three, or more years, and irradiations make the patient tolerable. A large number of cases is reported.

RICHARD KERN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Berman C. The Clinical Features of Primary Carcinoma of the Liver in the Bantu Races of South Africa. *South African J. Med. Sci.*, 1915, 5, 92.

Primary carcinoma of the liver the rarest tumor among Europeans, is undoubtedly the most frequent form of carcinoma among Bantu and various other races, and occurs with great frequency in most pigmented races.

The observation of 66 cases has resulted in dividing them into five clinical groups, according to symptomatology.

Group I. Frank cancer (63.6 per cent). The signs and symptoms are referred to the liver from the outset in patients who were previously in good health. The mode of onset was gradual. The symptoms were abdominal pain, ascites, and dyspepsia. The physical signs were loss of weight and emaciation, enlargement of the liver tenderness of the liver jaundice (43 per cent) ascites (53 per cent) dilatation of the superficial abdominal veins (9 per cent) edema (39 per cent) and hematemesis in one. Secondary anemia was frequent feature.

Group II. Acute abdominal cancer (9.1 per cent). These patients suddenly developed acute surgical conditions of the abdomen due to rupture of carcinomatous nodules or erosion of blood vessels on the free margin of the liver without previous remission of their condition. The mortality was high. Those who survived operation, later developed the clinical picture of typical primary liver cancer.

Group III. Febrile cancer (7.6 per cent). This is the most rapidly growing form of primary liver cancer. Fever is the salient clinical feature. The symptoms are not unlike those of septic liver abscess.

Group IV. Occult cancer (5 per cent). There are no complaints directly attributable to disease of the liver. The disease is discovered either during routine examination or at autopsy.

Group V. Metastatic cancer (4.6 per cent). The symptoms due to metastases completely overshadow the primary lesion in the liver. These were due to secondary deposits in the lungs, ribs and brain.

The prognosis in all these cases is hopeless, and the duration of the disease never longer than four months. The average length of stay in the hospital was eighteen and two-tenths days. The most rapidly fatal cases occurred in Groups II and III. The treatment was essentially palliative, and was directed toward the relief of pain and discomfort. It is possible that roentgen therapy may prove of value in treatment, but was not tried in these cases. Surgical intervention is impracticable.

HAROLD LAUFMAN, M D

Mirizzi, P. L. Physiological Sphincter of the Hepatic Bile Duct. *Arch Surg*, 1940, 41 1325

Evidence is presented to prove the existence of a physiological sphincter of the hepatic duct above the point of junction with the cystic duct. Contraction of the hepatic duct was observed by taking cholangiograms at the time of operation. This contraction was noted only when the ducts were elastic and thin walled, and not when they were dilated or thickened. Iodized poppyseed oil was injected into the gall bladder at the rate of 1 c.c. a minute to a total dose of 3 c.c.m. in three minutes, and roentgenograms were taken at ten-minute intervals. Overdistention was avoided, because it was found to prevent contraction.

It was found that the contractile mechanism of the hepatic duct functions when the gall bladder empties itself spontaneously. In this phase, the gall bladder, cystic duct, and common bile duct system can be visualized, but the oil does not pass into the intrahepatic branches of the biliary tree. If, however, the gall bladder is compressed after injection, the opaque substance passes violently to the whole biliary tree, to be followed by contraction of the terminal segment of the hepatic duct, which allows the gall bladder, and cystic and common ducts to form a separate excretory system. It was further observed that any resistance at the distal third of the common bile duct causes this duct to empty into the cystic duct and produces contraction of the hepatic duct, which prevents any further reflux of the opaque substance. This shows the indirect protecting rôle of the hepatic duct, which favors repletion of the gall bladder with bile during the intervals of digestion when the papilla of Vater is closed, as well as in any circumstance which changes the internal pressure of the common bile duct.

In a patient having a cholecystoduodenal fistula, who was studied, a portion of the oil passed to the duodenum through the fistula and another portion to the cystic duct and common bile duct system, while the upper branches of the biliary tree were not invaded in spite of compression of the gall bladder. There was sufficient contraction of the hepatic duct in this case to prevent the column of oil from ascending, and the excess passed through the fistula, which played a secondary neutralizing part. The same phenomenon is seen when communication between the cystic duct and duodenum is artificially established.

Longitudinal section of the hepatic duct suppresses its defensive contraction and thus favors duodenobiliary regurgitation. Consequently, the integrity of the hepatic bile duct must be respected in making a biliary-intestinal anastomosis.

S LLOYD TEITELMAN, M D

Weimershaus, P. A Review of the Cases of Pancreas Necrosis and of Chronic Pancreatitis and Their Late Results at the University Surgical Clinic at Jena During the Years 1920 to 1937 (Zusammenstellung der Pankreasnekrosen und der chronischen Entzündungen des Pankreas und ihre Spätergebnisse an der Chirurgischen Universitäts Klinik zu Jena in den Jahren 1920 bis 1937) Jena Dissertation, 1939

Weimershaus reviews all the cases of pancreatic necrosis and chronic pancreatitis which occurred at the Jena surgical clinic during the years from 1920 to 1937. There were 52 cases, 44 treated operatively, and 8 conservatively without operation. Of the patients who were operated upon 16 died. This is an operative mortality of 38.09 per cent for the cases of pancreatic necrosis. Only 9 of the patients were men, and 43 were women. Two of the patients were between twenty and thirty years of age, 8 between thirty and forty, 13 between forty and fifty, 15 between fifty and sixty, 12 between sixty and seventy, and 2 were over seventy years of age. There were 2 patients with chronic pancreatitis, 4 with edema of the pancreas, 12 with acute pancreatic necrosis and exudate into the abdominal cavity, and 10 with hemorrhages of the pancreas and other organs of the abdominal cavity, fat necrosis with pentoneal exudate, and partial liquefaction of the pancreas. Of all the patients cured by operation and of those who died of the operation 85.7 per cent and 87.5 per cent, respectively, revealed involvement of the bile passages. Of the 8 cases treated non surgically about half had a history of gall bladder colic. In 3 cases, in spite of previous cure of the gall-stone disease, pancreatic necrosis developed later. The method of treatment, the results, the secondary operations, and the late results are discussed in separate groups individually (WELCKER) LEO A JUHNKE, M D

MISCELLANEOUS

Nobécourt, P. The Syndrome of Abdominal Pain and Infectious Purpura in a Girl of Thirteen (Syndrome abdominal douloureux et purpura infectieux chez une fille de 13 ans) *Presse méd*, Par, 1940, 48 983

The author reports a case of a girl aged thirteen years and seven months who entered the hospital because of severe abdominal pains, and was operated upon shortly thereafter with a diagnosis of appendicitis. However, a normal appendix was found. On the following day the patient had to be operated on again because of intraperitoneal hemorrhage, but no source of the bleeding could be found. Soon afterward she developed petechiæ on the abdomen, arms,

legs, and the right eye. Within three days of operation she had her first menstrual period which lasted three days. Within nine days of operation she was well, the petechiae having faded, and the fever which had been prominent feature having disappeared. Pharyngeal smear showed pneumococcal smears of the conjunctiva showed *Staphylococci*. Bleeding time was fourteen minutes, clotting time six minutes. The red-cell, white-cell, and platelet counts, and the blood smear were normal, the tuberculin test was slightly positive and the Bordet Wassermann and the Kahn reactions were negative.

Abdominal pain in connection with purpura has been recognized for a long time. It may occur in the course of an established purpura, the diagnosis then being easy or as a primary manifestation preceding the appearance of the purpura, in which case the diagnosis is more difficult. There is nothing characteristic about the pain. Vomiting, hematemesis, hematuria, or melena may accompany it. It generally lasts one or two days.

Abdominal pain occurs more frequently in some forms of purpura than in others. It is most common in the form characterized by the triad of petechiae, arthropathy and gastro-intestinal disturbances. It is less common in the form of purpura called primary infectious purpura which is characterized by severe infectious phenomena analogous to septicemia and by a purpuric eruption. It is almost never seen in the Werthoff Wichman syndrome in the alebille purpura with giant ecchymoses, or in chronic purpura. Gross examination of the peritoneal cavity in the cases with abdominal pain shows congestive lesions on the visceral peritoneum. The author believes that the pathogenesis of this syndrome lies in intestinal spasm as a result of some excitability of the sympathetic nervous system.

Primary infectious purpura, of which the reported case is an example, are characterized by the abruptness of their onset, the purpura appearing on the second or third day. The eruption is macular with fine vesicles containing clear purulent, or hemorrhagic fluid in the center of the macules. This usually dries rapidly but sometimes ulcerates. The most common causative organism is the meningococcus, then the pneumococcus, and the disease is usually severe. There is no blood dyscrasia in this form.

Therapy is organized along three lines. Intestinal spasm is combated with heat, liniments, and antispasmodic drugs. The hemorrhages are attacked with such measures as pectin, subcutaneous blood or Witt's peptone or hepatic extract, prepared according to the method of Whipple and given by mouth. The infection is treated by supportive methods and, if the organism is the meningococcus or pneumococcus, with appropriate sulfanilamide derivatives or antiserum. RICHARD WARREN, M.D.

Mitchell, G. A. G. The Spread of Acute Intraperitoneal Effusions. *Br J Surg* 1940, 27, 29.

Fluids escaping within the peritoneal cavity following an intra-visceral perforation are guided by

series of natural barriers toward certain potential spaces where they tend to collect. According to accepted teaching, material escaping from perforated duodenal ulcer passes down to the Recenal region, along the right external paracolic sulcus. However, careful investigation of a number of such cases coming to early operation showed the presence of stomach contents in the ileocecal region. Also the upper part of the right external paracolic sulcus was apparently uncontaminated. Again, it is taught that the stomach contents flow from the right external paracolic gutter into the pelvis, and then into the left infracolic space. In practice it is observed that the left infracolic space is sometimes contaminated while the pelvis remains unaffected.

Fluid from perforated duodenal ulcer readily escapes from Morison's pouch into the right subphrenic space, according to common belief. This is refuted by the fact that shoulder pain is not a characteristic early symptom in this condition.

After describing the intraperitoneal barriers or waterbeds within the peritoneal cavity the author describes his experimental methods for determining the spread and localization of intraperitoneal effusions. The method adopted was performed on still-born infants, preferably fresh. Perforations were made in various hollow viscera through which a cannula was passed. A very fine barium emulsion was slowly injected under pressure of from 1 to 3 mm. of mercury one or three hours being required for each experiment. The course of the injection as observed on the roentgenographic screen and frequent x-rays were taken at various intervals of time. As a result of these studies, the writer arrives at the following conclusions:

The supracolic space is subdivided by a simplified terminology into right and left subphrenic and right and left subhepatic spaces.

An accumulation of fluid in the right subhepatic space does not normally escape between the liver, right kidney and right colic flexure into the right external paracolic groove but overflows into the right infracolic space through the interval between the liver gall bladder transverse colon and falciform ligament. The right external paracolic groove really is a subdivision of the right infracolic space, is involved later by spread across the front of the ascending colon, and the fluid then runs upward along this groove and so invades the right subphrenic space.

The pelvis is mainly invaded by spread of fluid from the infracolic spaces. There is no experimental evidence that the main channel of invasion is along the right external paracolic sulcus. It is shown that the common belief that fluids spread from the pelvis into the left subphrenic space along the left external paracolic groove cannot be verified experimentally because this fluid is arrested by the phrenocolic ligament. The left subphrenic space is involved by direct spread from the main left infracolic space and to a lesser extent from the communication which exists between the right and left subhepatic spaces.

in the interval between the pyloric end of the stomach, the transverse colon, and the free edge of the falciform ligament
JOHN W. NUZZI, M.D.

Wilensky, A. O. General Abdominal Lymphadenopathy, with Special Reference to Non-Specific Mesenteric Adenitis. *Arch Surg*, 1941, 42: 71

Mesenteric lymphadenopathy is fairly common in children and in young adolescents. It may simulate numerous acute surgical conditions, with abdominal pain of varying severity, fever, and leucocytosis, differentiation is difficult or, frequently, impossible. The attacks subside, as a rule, but recurrences and recrudescences may follow and lead to the clinical picture of a chronic ailment. Although the condition is always secondary, no primary preceding lesion may be demonstrable.

Intra-abdominal lymphadenopathy occurs under several basic conditions: (1) as an accompaniment or integral part of some disease, such as typhoid fever or dysentery, (2) as a secondary manifestation of some intestinal lesion of more or less obscure origin, such as non-specific granuloma, and (3) as a completely understood accompaniment of the so-called "rheumatic group" of diseases usually associated with some strain of streptococci and often preceded by infection of the upper respiratory tract. There is another type of lymphadenopathy which cannot be associated clinically with any demonstrable preceding or accompanying lesion, and is referred to as non-specific mesenteric adenitis. Trauma, allergy, syphilis, tuberculosis, virus infection, toxemia *per se*, and parasites do not bear any causal relationship. No relationship with lymphogranuloma venereum can be demonstrated by the Frei test. The appendix is rarely the portal of entry for the causative agent. The occasional swellings of the mesenteric glands which may be observed following acute appendicitis, are due to abnormal anatomical arrangements. The number of cases in which the bacteria were studied

is small, and only about 5 per cent yielded bacterial growth. Various kinds of streptococci predominated.

However, in both segments of the alimentary tract, in the neck and in the abdomen, the lymphadenoid apparatus and the lymph-connecting channels are strikingly alike. Wilensky emphasizes the similarity of physiological, etiological, mechanical, and pathological aspects in disease originating in the oronasopharynx and in that originating in the terminal ileum. The similarity to the ordinarily observed phenomena of cervical adenitis is absolute. In either case local injuries or infections permit passage of the causative agent to the appropriate lymph nodes. It is pointed out that mesenteric adenitis is not an isolated, bizarre, peculiar, or obscure disease, but rather a sequela of other diseases and infections. Accordingly, it may be (1) a local effect of absorption from some local non-demonstrable lesion in the ileal segment (this includes various forms of transient enteritis and other surface infections, various gross and microscopic injuries, and other forms of physical and chemical trauma), or (2) a general response of the entire lymphatic apparatus to a causative agent introduced into a distant and/or regionally connected portal of entry. Commonly, entry seems to be related to "catarrhal" or "throat" infections, less commonly, to a hematogenous mechanism. A third possibility is that of an agent swallowed from the oropharynx and passed along to the terminal ileum, from which local absorption occurs.

Treatment of abdominal lymphadenopathy must be along the lines known to be correct and adequate for the original disease. In the presence of non-specific adenitis and the absence of suppuration or some other complication, conservative treatment would be ideal. However, the present inability to differentiate the condition from surgical emergencies necessitates more or less frequent abdominal exploration in order to establish the true nature of the intra-abdominal condition.

EDWIN J. PULASKI, M.D.

GYNECOLOGY

EXTERNAL GENITALIA

Svetozár S. Vesicovaginal Fistulas in Women
(*Leber Harnsteife bei Frauen*) *Bratislava let*
Lit. 940 30 63.

The author reports the results of 6 operations for vesicovaginal fistulas in women. The pre-operative preparation in neglected cases must be thorough, and not only the local condition must be considered but also the general condition of the patient. Post partum fistulas are never operated upon before three months have elapsed after parturition usually six months after. The knee-elbow position is not recommended particularly but the Schuchardt incision is employed and frequently bilaterally in order to facilitate exposure. The main condition for success is the close approximation of the edges of the fistula without stretching of the surrounding tissue. Therefore, the neighborhood of the fistula must be prepared meticulously.

In the preparation one must be careful not to injure the peritoneum. This happened to the author several times as the peritoneum is employed to cover the suture line of the fistula. The edges of the fistula are not freed up. The vaginal wall is separated from the bladder for a distance of 35 cm. surrounding the fistula and the suture is made in three layers. By suturing the muscular layer the hole in the bladder is closed and by the injection into the bladder of from 30 to 50 c.cm. of physiological salt solution the suture line is tested for leakage. Then a second layer of sutures is employed in the muscle layer to reinforce the first layer. The third layer concerns the septum vesicovaginale and with this layer the vagina is closed by a suture which should disturb the tissues as little as possible (Method of Ferguson-Bragnebye and Foeth). Iodine catgut is employed throughout. A later repair of the perineum is done after healing of the fistula. The author then discusses the various methods of operation reported in the literature (Marchand, Wolkowitch, Kuestner, Doederlein, Roehmann, Mithras). The French prefer the transverse approach.

Fifty-seven cases with due to obstetrical causes and 4 follow to gynecological conditions. All of the latter were cured, five of the former 33, or 63.3 per cent were cured. The total cures amounted to 44, or 63.3 per cent. Of 43 vesicovaginal fistulas 40 were operated upon vaginally, 4 abdominally and 3 by combined operation of 8 vesicocervicovaginal fistulas, 6 were operated upon vaginally, 1 abdominally and by combined method. Of 3 vesico-urethrovaginal fistulas 2 were operated upon by the vaginal method and one by the abdominal. One case of vesicovaginal and rectovaginal fistula was repaired vaginally. In 3 of 45 vesicovaginal fistulas the operation was successful and death re-

sulted in 1 case. Of 8 vesicocervicovaginal fistulas, 6 were cured, and of 4 vesico-urethrovaginal fistulas 2 were cured. Of 3 vesico-urethrovaginal fistulas 2 were cured and the vesicovaginal and rectovaginal fistula was cured also. The great number of failures is due to the complicated material at hand. Fourteen patients had previous operations elsewhere without satisfactory results. In 8 the disease was of long standing. The author does not share the view of Reichenmiller that old fistulas heal poorly; he had many old cases, one of twenty-two years standing. Seventeen patients did not come back for another attempt. In 9 complicated cases he operated transvaginally. Four times he employed the Dittel-Lepan method, 1 times the Trendelenburg method, and twice the combined method. In 1 case after vaginal attempt the Trendelenburg method was tried but it had to be completed vaginally. Among these 9 operations there were 5 failures, but 3 patients could be healed later by vaginal operation. There was a total of 9 failures with cause of suppurative peritonitis. The source of the infection was pyococcus.

The author does not detail the advantages and disadvantages of the after-treatment with residual catheter and postoperative drainage. It leaves the catheter in from ten to fourteen days, administers diuretics and resorts to careful bladder irrigation at various intervals. In 4 cases intravaginal irrigation was employed. Vaginal douches are not employed. The after-treatment lasted twenty-one days. Of the cured patients 3 became pregnant later. Five of the pregnancies ended in abortion and 7 went to term. Four patients delivered spontaneously and fistula recurred. Two patients were delivered by abdominal cesarean section and with high forceps.

(*Blau J. Beck-Rakowitz*) *Le. V. J. Suter M.D.*

MISCELLANEOUS

Gruff U. Endometriosis (*Beitrag zur Kenntnis der Endometriose*) *Arch f. klin. Chir.* 940, 28 45.

A very detailed review on endometriosis from the surgical standpoint is given, heretofore only scanty report on this disease can be found in the surgical literature and the knowledge of this peculiar disease may be of great importance in differential diagnosis. The author first tabulates, according to 100 cases of resection of the rectum and 3 cases of incomplete partial operation for endometriosis in the rectocervical septum (reported in the literature) and gives the clinical and operative findings, the treatment, and results. This followed by observations on 75 cases of endometriosis of the abdominal cavity including of the thorax.

The first case of the thorax was that of a woman, aged forty in whom a colic fistula was made in the

year 1936 for ileus. Later she was again laparotomized for renewed attacks of ileus. Except for a hollow band, which extended from the left ovary to the region of the intestinal stenosis, only a so called infiltration of the flexure, which appeared to be a carcinoma, was found. Resection was undertaken and the aboral portion of the gut was sutured in as a single-barrelled artificial anus. Recovery followed relaparotomy, which was done ten days after the first intervention. Surprisingly, the operative specimen showed no carcinoma but an infiltration penetrating from without toward the intestinal wall up to the mucosa, in which typical uterine glandular tubes could be demonstrated.

The second case was that of a woman, aged forty-four, who had suffered for a long time with premenstrual symptoms of intestinal stenosis and had to be operated upon for ileus. The cause of the intestinal occlusion was found to be a tumor in the middle of the sigmoid flexure, which macroscopically had to be considered a cancer. At first, only a colostomy was done, but later a resection of the tumor and closure of the artificial anus was followed by recovery. The operative specimen again showed no carcinoma but typical changes in the nature of endometriosis.

There then follows a table of 31 cases of endometriosis of the vermiform appendix and observations upon just as many cases of endometriosis of the small intestine. Among these is included 1 of the author's own cases. It was that of a woman, aged thirty-nine, who complained of premenstrual pains in the hypogastrium for quite a long time. On the assumption of an acute appendicitis an operation was finally done, a typical appendectomy. In the small intestine, 15 cm. above the Bauhinian valve, there was found a kinking of the gut, around which from pinhead to lentil sized, chocolate brown nodules were to be seen. Resection of the diseased por-

tion of the gut was followed by a smooth recovery. With the next menstruation, there was a repeated attack of pain, for which a laparotomy was done at the gynecological clinic. A fist-sized, chocolate cyst on the right side was removed and extensive adhesions in the entire lesser pelvis were revealed. Recovery followed. The examination revealed a chronic appendicitis with oxyuriasis in the lumen of the appendix. There were signs of endometriosis in the small intestine, but none of a neoplasm. The demonstration of glandular tubes in the ovarian tumor was not possible.

Endometriosis in the inguinal region, the umbilical and cicatricial endometriosis, was then taken up for discussion. A case of endometriosis of the abdominal scar following a gynecological operation (probably ante-fixation of the uterus) from the Frankfort Clinic was discussed briefly. Among the complications of endometriosis, the author's own case of metastatic ovarian abscess following angina is reported and introduced here, as "typical signs of an endometriosis in the pelvic peritoneum" were demonstrable. Microscopically, only abundant granulation tissue with many plasma cells and streptococci was found.

After mentioning the conceptions regarding the genesis of the disease, the author remarks that resection of the stenoses of the small intestine must be designated as the method of choice. In ileus because of endometriosis of the large intestine, at first only emptying of the gut should be done when possible. Then in every individual case it must be decided, whether the intestinal resection should be carried out later, or, especially in older women, whether one must be limited to roentgen castration, which may lead to elimination or shrinkage of the endometriotic foci. In younger women, resection is to be preferred when there is no contraindication to a major surgical intervention. (H. HEIDLER) LOUIS NEUWELT, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Hanzlifer R. Perforation of the Wall of the Uterus by the Child. Leg During Pregnancy (Perforation der Uteruswand durch das Bein des Kindes in der Gravidität) *Zentralbl. f. Gynäk.* 1910, p. 143

The patient, as a twenty-one-year-old primipara, who had never suffered from abdominal disease. The last menses occurred on the fifth of July 1908. She entered the hospital as a house case on the first day of April, 1910. Following an entirely uneventful pregnancy, she was sitting quietly at work at a table at five P.M. on April the fifth, when she suddenly experienced severe pains, radiating out toward the inguinal regions bilaterally. Nausea and vomiting followed. She became pale and her abdomen was tense and painful to pressure, however the heart tones of the child were good.

The first thought was of premature separation of the placenta and a watchful-waiting policy was adopted, the pains became somewhat less acute but the vomiting continued. On the fourteenth of April, thirty-six hours after the onset of the severe pains, labor pains set in, and five hours later spontaneous delivery occurred with presentation of the occiput to the left oblique diameter. However, delivery of the left leg was not successfully accomplished. The girl-child, which was 48 cm. in length and weighed 3,000 gm., cried lustily. In the efforts to free the left leg the uterus was inverted and it was found that the perforated, the limb being firmly held by the uterus at level above the middle of the thigh. It was held so firmly that a deep furrow around the thigh had resulted with consequent circulatory disturbance in the extremity.

The evidence of hindered circulation in the incarcerated member disappeared in a short while. A laparotomy was done immediately and the uterus was reinverted and extirpated as there was bloody dirty looking fluid in the abdominal cavity with distention of the bowel and reddening of the peritoneum. Six days after operation the patient died of peritonitis. Histological examination of the uterine wall in the region of the perforation did not disclose anything abnormal.

An explanation of the spontaneous rupture of the uterus during pregnancy with extrusion of the leg through the opening cannot be given. The perforation had apparently occurred thirty-six hours before the onset of labor and the sudden attack of pain.

(HANS HEMMER) JAMES W. BIRD, M.D.

Shurt E., and Barrie M. M. O. The Effect of Estrogens on True Pre-Eclampsia and Eclampsia. *Am. J. Obst. & Gynec.* 1910, 4 1003.

In addition to the records previously reported of the pre-eclamptic and eclamptic women treated

with estrogens, the protocols of 7 more pre-eclamptic and 3 convulsive eclamptic patients similarly treated are given. These women were not restricted regarding activity or diet except for the limitation of sodium chloride in several of them.

Barrie, working in England, has recorded eclamptic convulsions in certain rats defective in Vitamin E which were suddenly given large doses of d- α -tocopherol. The histological lesions in these animals simulated those of human eclampsia. She relates this to the theory that estrogen defect is an important factor in the onset of eclampsia, as Vitamin E is anti-estrogenic in character.

The clinical effects of estrogens on these women are slow in developing, but favorable influences on convulsions, stupor, blood pressure, urinary volume and albumin have been observed.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Raunmo, J., and Kahanpää, V. The Principles of Treatment of Apoplexia Uteroplacentaris (Ueber die Behandlungsprinzipien in Fällen von Apoplexia utero-placentaria) *Acta obst. et gynec. Scand.* 1910, 20 243

There are two main trends in the treatment of premature separation of the placenta, concern the expectant treatment aiming at spontaneous delivery and active treatment usually by laparotomy. Many obstetricians use both methods according to the findings in the given case. Raunmo and Kahanpää give a survey of the cases observed in the Women Hospital in Viipuri, Finland. While from 1901-1934 their policy was chiefly conservative, they changed in 1934 to more active, surgical treatment of uteroplacental poplexy and, as the other factors have remained about equal, they feel justified in comparing their results in these two periods.

In these twenty years, they saw 63 cases of uteroplacental poplexy in total of 1,058 deliveries, i.e., an incidence of 7 per cent. This is a higher incidence than reported by most authors. They attribute it to a high incidence of toxemia of pregnancy in that territory to a high percentage of pathological cases among their admissions in general, and to the fact that they counted also minor abortions. Fifty-three per cent of the 63 women with abortion, 8 women had albuminuria, and 34 of them also had eclampsia or eclamptic 3 per cent had total abortion. Thirty-nine per cent were primiparas 50 per cent had premature partus. The infant mortality exceeded the percentage babies who would consider normal among premature babies.

The authors presently obstetrically treated group (1901-1933) comprised 64 women and the "prevalently" surgically treated group (1934-1936)

1938) 69 women In the first group, there were only 3 cases of cesarean section (3 per cent), in the second group, there were 33 such cases (48 per cent) In both groups vaginal operation was done in about one-fifth of the cases Five mothers of the first group and 1 of the second group died These deaths were attributed to various causes 2 women obviously died from most severe eclampsia, while the hemorrhage was of not much importance Two women had severe toxemias, and they, too, probably did not die from the hemorrhage One patient died chiefly from the hemorrhage, and 1 was admitted moribund, no definite evaluation of the last case was possible All of the women had not been operated on Probably none of them could have been saved by more active procedures

The authors attribute the improvement in their maternal mortality after adoption of more active procedures to the fact that many toxemia cases were operated on immediately after the development of the first signs of abruption As to infant mortality, 1 child of 26 who were delivered alive by cesarean section and had been mature and not deformed, died The infant mortality in the "conservative" group was 14 per cent, in the "surgical" group 3 per cent A comparison of the three methods of treatment used, regardless of the two periods, is given in this table

Method of Treatment	Maternal Deaths	Infant Deaths	
Spontaneous delivery, including rupture of the membranes	2 (2%)	1 (3%)	Only mature children living on admission are considered
Vaginal operations	4 (12%)	4 (40%)	
Cesarean operation	0 (0%)	1 (4%)	

Both the maternal and infant mortality, in the authors' opinion, suggest that active surgical treatment is preferable as a rule

In cases of severe and advanced toxemia of pregnancy with abruption of the placenta, the authors advocate conservative treatment, especially because the baby usually is already dead in these cases In early and light toxemias with a living baby, they prefer abdominal cesarean section Macroscopically visible uterine hematomas are not an indication for hysterectomy, as they heal well While toxemia is an important cause of apoplexia uteroplacentaris, it is not the only cause In the grave cases with a dead child, the authors frequently used dilatation, often followed by version or forceps extraction Saline and blood transfusions sometimes were used in cases with shock, but as they do not correct the kidney damage, their value is disputable, and at times they may be dangerous

Early diagnosis is imperative, and it is often possible in patients who are hospitalized because of toxemia They begin to complain of slight abdominal pain, and suffer from nausea, irritability, pallor (not from anemia but from shock), and labor-like pains, the fetal heart sounds get weaker The blood pressure falls and there is tenderness of the uterine wall Vaginal hemorrhage is a comparatively late sign, and so are severe pains, tenderness, marked anemia, and cessation of the fetal heart heat, which is generally mentioned in the textbooks as being significant

A follow-up study showed that about half of the women with abruption who had answered to questionnaires, had again conceived, the interval between the abruption and the next birth was two and eight-tenths years (compared to an interval of three and three tenths years after normal or premature birth in general) Sixteen of 56 conceptions after abruption terminated in abortion, which coincides with the incidence in cases without abruption The authors conclude that apoplexia uteroplacentaris does not produce a temporary or lasting sterility, and the incidence of lasting kidney impairment after toxemia with abruption is not higher than after toxemia without abruption HEINRICH LAMM, M D

GENITO-URINARY SURGERY

ADRENAL, KIDNEY AND URETER

Hamilton, J. E. Pheochromocytoma of the Adrenal with Paroxysmal Hypertension; A Case Relieved by Surgery. *Kidney Int J* 940 33 572.

The thor presents case of pheochromocytoma occurring in a thirty-seven-year-old white woman who had the following symptoms: intense throbbing headaches, hot flashes, pounding of the heart, and dyspnea appearing in periodic episodes lasting for several minutes. Ten months before admission the patient became aware of a painless lump in her left upper abdomen, which gradually enlarged to the diameter of about 5 in. This mass caused dragging discomfort, nausea and occasional vomiting, increasing fatigue, dyspnea on exertion, and orthopnea. Examination revealed a well-developed white woman with normal secondary characters. Her blood pressure ranged from 60-135 to 10-80. A rounded, slightly tender mass about 3 cm in diameter could be both seen and felt in the upper quadrant. It was movable and descended slightly upon inspiration. Laboratory findings are essentially negative as were too the gastro-intestinal and pyelographic x-ray studies.

At operation a rounded brownish purple mass 3 cm. in diameter was found pushing through the gastrosplenic ligament. The stomach and pancreas lay above it, the spleen to the left and the colon below. Palpation through rent in the gastrosplenic ligament disclosed that the mass was cystic and that it arose from a broad pedicle in the region of the left kidney. About 50 ccm. of thick brownish material resembling old blood was aspirated which partially collapsed the cyst. At this point because of impending shock, the wound was hastily closed and the collapsed cyst, after first being opened, was stitched into the left angle of the wound.

Eleven months later the patient reported she had had several attacks resembling them but more severe than the ones she had had previous to the operation. She was readmitted to the hospital and found to have repeated hypertensive paroxysms, when she would become flushed and her blood pressure would mount from basal reading of 90-70 to about 200-120. A tentative diagnosis of pheochromocytoma was made. A second laparotomy was performed and a soft egg-shaped reddish brown mass approximately 3 cm. in length was found adherent to the site of the previous manipulation. It extended directly backward through the gastrosplenic ligament to the retroperitoneal tissues. The mass was skinned off of its bed, which occupied the position of the left suprarenal gland. No trace could be found of the suprarenal gland. The convalescence was uneventful. Nine months after operation her blood pressure 55/90.

Gross description of the tumor was an elongated, lobulated spheroid, soft in consistency and dark brown in color.

Microscopic examination showed a lobulated arrangement of the structure and in some sections there are cysts lined by endothelial like cells. The parenchymal cells are elongated and had eosin staining granular cytoplasm. JOHN A. LOER, M.D.

Swan, R. H. J. Injuries of the Kidney. *Brit J Urol* 940, 6.

Injuries which involve the kidneys are of the most varied kind, both in the extent of the laceration of the organ and in the severity of the symptoms. It will be convenient to consider them under the following headings:

Subperitoneal injuries in which there is no open wound communicating with the exterior

2. Lacerated and punctured wound

3. Gunshot wounds

SUBPERITONEAL INJURIES

These form by far the largest group of cases of renal injuries. They vary from small contusions accompanied by hematuria to complete rupture of the kidney into two or more parts. Only very rarely are both kidneys injured.

The pathology may be classed as follows:

Lacerations of the perinephric fat (about as lesion in the renal parenchyma)

Subcapsular hemorrhage (without visible laceration of the renal cortex)

3. Laceration of the parenchyma of the kidney of varying degrees. There may be small fissures running across on both surfaces of the organ usually radiating from the hilum or deeper lacerations extending into the calyces or into the renal pelvis. More rarely there may be longitudinal fissures along the convex border of the kidney.

4. Rupture of the renal vessels or renal pelvis. Occasionally the vessels may be torn without laceration of the kidney and more rarely the ureter may be detached from the pelvis. In the latter event there may be an increasing effusion of urine in the perirenal area about hematuria.

5. Septic infection is likely to occur in any effusion in which blood and urine are mixed.

6. Associated injuries. There may be present fractured ribs, rib trauma, fracture of the spine, or laceration of other viscera such as the liver, spleen, or alimentary canal. In some cases the peritoneum may be torn over the perinephric effusion and allow blood and urine to escape into the general peritoneal cavity which could produce symptoms of peritoneal irritation and peritonitis.

Symptoms. The symptoms of renal injury are briefly put may be hematuria and the formation of palpable tumor in the renal fossa.

Pain in the side is almost invariably present from the time of the injury but may be due to trauma of the abdominal wall or to fracture of the lower ribs.

Hematuria occurs in fully 99 per cent of the cases of ruptured kidney. The appearance of blood in the urine may be delayed for several hours or even days after the injury and the amount of blood present is no index of the severity of the traumatism sustained by the kidney.

Formation of a tumor in the loin is a common feature of a lacerated kidney. It consists of an effusion of blood or of blood mixed with urine in the perinephric tissues but in rare instances in which the renal pelvis or the upper ureter is torn without laceration of the renal tissue or vessels, the leakage of urine into the fatty tissue may cause the swelling.

The quantity of urine passed after an injury to the kidney may vary. In some cases there is a diminished quantity while in others there may be complete anuria. This is usually a temporary suppression and is followed after a day or two by polyuria.

Later symptoms in a case of ruptured kidney depend greatly upon the severity of the renal laceration, upon the presence of injury to other viscera and upon the possibility of infection in the kidney or in the effusion in the perirenal tissue.

Septic infection is always likely to occur in any effusion of blood especially when mixed with urine. The infection may spread upward from the bladder or may arise by hematogenous infection from the blood stream.

Diagnosis. The diagnosis of a laceration of the kidney is in most cases relatively easy. The history of a crush injury, followed immediately by pain in the side, collapse, and shock, the palpation of a tumor in the lumbar region, and the presence of blood in the specimen of urine passed after the accident would point to the diagnosis. Hematuria may be delayed, but is present at some time in the great majority of cases. In cases in which hematuria is absent the diagnosis will be made on the nature of the accident, the rigidity of the abdominal muscles on the affected side, the presence of a tumor in the lumbar region, and the amount of shock. In every case, thought must be given to the possibility of severe traumatism to other viscera which may be present in crush injuries. Examination should be made of the chest wall for fracture of one or more ribs, with possibly an intrathoracic lesion, and of the abdomen for increasing rigidity and for free fluid which may lead to a suspicion of rupture of the intestine, liver, or spleen. The spine should be examined for signs of fracture or fracture dislocation, and the pelvis may undergo fracture with injury to the urethra or bladder which may be the source of the blood in the urine.

Treatment. The primary treatment of cases of renal injury consists of rest, warmth, and measures to combat the shock that may be present. The patient should be kept absolutely quiet in bed and morphia should be given freely, partly to maintain complete rest, but also to relieve pain and to quieten

the circulation. Strapping the whole side often relieves the pain considerably. A careful watch must be kept upon the pulse rate and the blood pressure, a quickening beat and a progressive fall of blood pressure being indications of increasing hemorrhage. In cases in which no urine is passed after the injury, especially if the desire to micturate becomes increasingly urgent, a catheter should be passed under the most strict aseptic precautions, when it may be found that the bladder is filled with blood clots. These must be broken up and washed out or removed by means of an evacuating cannula and bottle, as is used after crushing of a vesical calculus. If clots cannot be removed in this way, suprapubic cystostomy may be necessary.

The question of instrumental and roentgenographic examination of the patient may arise in some cases, but it must be acknowledged that many patients are too neutly ill to allow of these and that the evidence obtained by them is too uncertain to be of great value. Cystoscopic examination during the hematuria will show the side of the bleeding and may prove the remaining kidney to be present and functionally active if clear urine can be seen from the other side. Roentgenographic examination will eliminate fractures of the ribs, spine, or pelvis and may show a loss of the normal outer border of the psoas muscle on a plain film if an effusion of blood is present while pyelographic examination may prove useful in showing the escape of the dye outside of the pelvis and calyces, or distortion of the latter.

Occasionally cystoscopy and ureteric catheterization may be necessary in cases in which the ureter has become blocked by blood clots which give rise to severe colic. In these cases relief of the obstruction and the pain has been obtained by the drainage with the ureteric catheter.

The indications for immediate operation upon cases of ruptured kidney can be summarized therefore, as follows: increasing or persistent hemorrhage, as evidenced by a steady increase in the pulse rate, progressive anemia and fall of the blood pressure, increasing pain and muscular rigidity over the side of the abdomen and flank, especially its extension to the lowest abdominal quadrant, and increasing size of any palpable tumor in the renal area.

The operation carried out on the kidney must necessarily be, in the first place, an exploration, and it must be left to the judgment of the surgeon to deal with the condition presented to him. It should be the constant aim of the surgeon to preserve the kidney if there is any chance of saving the organ, and it has been shown that functional recovery of the renal tissues is possible after the repair of lacerations at the expense of ecentration in the area of injury. In many cases a laceration of the cortical area, even implicating the calyces, may be closed by mattress sutures, preferably with ribbon catgut, as suggested by Lowsley, or a piece of muscle or fat may be incorporated in the line of suture to add additional strength, while in other cases firm packs of gauze may be used and left *in situ* for some days.

In some cases in which the kidney has been lacerated, operation may become necessary at a later stage. Bleeding may recur after varying interval and there is always the possibility when urine has been extravasated into the perinephric hematoma that infection may occur.

By adding three groups of cases published by Young, Reese and Sutter together it will be found that in 33 cases treated wholly by expectant methods 204 or 61.4 per cent of the patients died. Two hundred and twenty-eight patients were operated upon without removal of the kidney and of these 3 (2.3 per cent) died. Of 309 patients on whom nephrectomy was performed 36 or 11.6 per cent died. Open wounds of the kidney are less frequent than the lacerations produced by violence and include those received from stabs of a dagger bayonet forks, falls upon spiked railings as well as those received in warfare from bullets, shrapnel, or shell fragments. The anatomical position of the kidney deep in the loin makes it improbable that any object penetrating to the kidney should not injure other organs in addition to the kidney.

Wounds received from knives and daggers may enter from the back, from the side or from the front, and the line taken by the implement may give some guide as to whether other organs are likely to be injured, those most frequently involved being the pleura, liver and intestines. There is usually bleeding from the wound and hematuria occurs, though this may be delayed for some hours.

If the injury involves the calyces or the renal pelvis, the blood escaping from the wound will be mixed with urine, though the latter may not appear for some time after the accident because of temporary inhibition of excretion. There is usually pain in the side with some fixation of the abdominal muscles on the injured side, but in contradistinction to the subcutaneous injuries there is seldom any perinephric effusion of blood or urine owing to the escape or the latter through the parietal incision and in consequence there is no palpable tumor in the loin. In cases in which the renal vessels are divided, the hemorrhage may be severe and rapidly fatal. In less severe cases the bleeding from the external wound gradually diminishes, whereas the amount of urine in the discharge increases.

Septic infection is particularly likely to arise in these cases, usually about the fourth day after the injury and give rise to pyrexia, increased pain and the appearance of purulent discharge from the wound.

The treatment of these cases should be directed in the first instance to the arrest of hemorrhage and the thorough cleansing of the wound. The edges of the wound and as much as possible of the track should be excised, and if the bleeding is only slight the area may be lightly packed with vaseline gauze or with gauze soaked with flavine paraffin. In cases in which the bleeding is persistent the wound should be fully opened and the kidney exposed. Every effort should be made to preserve the organ, any

laceration being closed by including pieces of fat or muscle under the sutures.

GUNSHOT WOUNDS OF THE KIDNEY

Gunshot wounds of the kidney are usually seen during warfare, but occasionally they may occur in civil life. They may be caused by rifle machine-gun or revolver bullets, by shrapnel balls, or more frequently by fragments of shell or bomb casing. A bullet may perforate the kidney and cause comparatively little damage unless the major calyces of renal pelvis are injured, in which case there is an escape of urine into the perinephric tissues and a pronounced risk of subsequent infection. The lesion caused by a shell or bomb fragment is usually more severe because of the shape and roughened surface of the missile, the rotary motion of the fragment, and the fact that the missile is particularly liable to carry with it pieces of clothing and equipment, which may seriously infect the damaged area.

The damage to the kidney by gunshot wounds varies within wide limits. The organ may be merely contused by the passage of a bullet in close proximity which causes subcapsular laceration similar to that seen in non-penetrating wounds. It may be perforated by the missile, sometimes bisected in transverse wounds, while in other cases the renal tissue may be severely palpated.

Coincident injury to the liver, spleen, stomach, and intestines is not uncommon and experience during the last war demonstrated that cases in which the colon was lacerated gave a worse prognosis than those in which other visceral injury complicated the picture. Besides injury to the abdominal viscera as a complication of renal injuries, it is by no means uncommon to find perforation of the lower thorax, with effusion of blood into the pleura.

Diagnosis. It will be seen that the diagnosis of gunshot injury to the kidney does not as a rule present much difficulty. The position and the direction of the wound, the pain and peritoneal effusion followed by hematuria, and the escape of blood-stained urine from the wound make the diagnosis plain. Localization of the fragment by shift films or by stereoscopic films may be necessary and, in a few cases in which there is no immediate urgency, it may be advantageous to obtain more accurate localization of a fragment or bullet by means of a radiopaque catheter passed up the ureter after cystoscopy. Of equal importance to the diagnosis of renal injury is the necessity to form an opinion as to whether other viscera have sustained injury at the same time so that if operation is contemplated, an incision can be planned to treat both organs.

Treatment. The preliminary treatment of any patient suspected of having injury to the kidney should be directed against shock. It should be maintained at complete rest, given morphia in full doses to allay his pain and anxiety and have warmth applied by means of radiant heat cradles or electric blanket if current available. If it is thought that no other organ than the kidney has been wounded,

the surgeon should not hasten operation unless there is evidence of progressive bleeding, of infection, or of peritoneal irritation. When the injury is caused by a shell fragment or by a bomb and the missile remains in the tissues, as shown by an x-ray examination, there is strong probability of infection following from pieces of clothing or dirt introduced into the wound. The area around the entrance wound and the track made by the fragment should be freely excised, the missile removed, and the laceration of the kidney should receive treatment. The treatment given to the kidney will depend upon the nature of the lesion displayed. If the wound does not involve the renal vessels and the amount of laceration is not too severe, every effort should be made to preserve the organ, the lacerations being closed by mattress sutures of ribbon catgut and reinforced if necessary by pieces of fat or muscle enclosed in the sutures. In perforating wounds caused most frequently by rifle or machine-gun bullets and in which it is thought probable that other viscera have been injured, the immediate necessity will be to treat these organs and to treat the renal wound from the same incision rather than to close the abdominal wound and then to make a separate opening in the loin, because of the rapid fall of the blood pressure which may result from the movement.

Perforating wounds of the lower thorax involving the kidney may be very difficult to differentiate from intra-abdominal lesions. Considerable rigidity of the abdominal wall may be present without any peritoneal injury, in the absence of signs of continued bleeding these cases may be carefully watched, but in large open wounds of the chest, operation will be necessary. A laceration of the upper pole of the kidney can be sutured through a rent in the diaphragm which can afterward be sewed up.

Results Gunshot wounds of the kidney must be regarded as of serious import and as carrying a heavy mortality, and it has been pointed out that statistical figures gained from forward and base hospitals during wartime are probably inexact, as many patients probably succumb before reaching the hospital. In cases in which other viscera are injured the death rate is higher and it would appear that coincident injuries to the colon are the most serious. The association of a lower thoracic injury with a wound of the kidney does not carry as grave a prognosis as a case in which a hollow viscus is lacerated.

JOHN A. LOEF, M.D.

Hareide, I. Roentgenography in Renal Injuries, with Special Consideration of Intravenous Urography (Ueber die Roentgenuntersuchung bei Nierenverletzungen unter besonderer Berücksichtigung der intravenösen Urographie). *Acta radiol.*, 1940, 21, 292.

In the examination of patients with trauma in the renal region several questions of great importance in the treatment arise. Is there an injury of the kidney? Of what nature and extent is the renal injury? In the case of a nephrectomy is the uninjured kidney

able to take over the renal function? Are there any complicating lesions, especially in the intra-abdominal organs? Next to the clinical examination, roentgenography is of decisive importance, especially urography. The usual clinical examination generally gives more or less definite information as to the presence of a renal injury, but the diagnosis may be difficult in the absence of the most important symptom, hematuria, especially in the presence of rupture of the renal artery or of the ureter or in the presence of occlusion of the ureter by a coagulum.

After the diagnosis has been made, it is very important to establish the anatomical details of the renal injury, as the nature and extent of the anatomical changes are decisive in the treatment. Clinically, the extent of the hemorrhage may be judged by the palpable hematoma and the general symptoms of internal hemorrhage. Aside from the fact that the symptoms of an acute anemia may, for example, be due to the complicating rupture of an intraperitoneal organ, and that the palpable mass may be due to urinary infiltration, hemorrhage is only one of the factors that is decisive in the selection of the treatment. Even when the hemorrhage is not serious to life, the renal injury may be of such a nature that a nephrectomy or a conservative operation is indicated, as in the presence of a more or less severe injury of the renal pelvis. When the renal injury is severe enough to require nephrectomy the condition of the other kidney may contraindicate the operation. Even though congenital renal hypoplasia and aplasia are not common they are found often enough to require consideration in practice. Intravenous urography is the surest and easiest method of determining the condition of the uninjured kidney.

The diagnosis of possible intra-abdominal complications, e.g., rupture of the liver, spleen, or intestine, requires the knowledge of the examination technique for and roentgenological symptoms of exudate, blood, and free air in the peritoneal cavity. In the examination of injuries from dull force, urography may be retrograde and intravenous. Although retrograde pyelography has given good results, it has certain deficiencies that disbar it from use as a routine examination of recent renal injuries, as in the presence of marked hematuria or a poor general condition, the method also fails in children and harbors the possibility of infection. Intravenous urography has the advantages of simplicity of execution and absence of infection.

The author reports on 16 patients in whom hematuria appeared after a trauma in the renal area, either as a single symptom or associated with more or less typical local and general symptoms of a renal injury. The examinations were made within from a few hours to three days after the injury. The importance of the earliest possible examination after the injury is shown by several cases, inasmuch as characteristic changes in the urogram, which are distinctly evident in the first examination, might disappear in a few days.



Fig. 1



Fig. 2

The injuries may be of all possible grades from slight crushing to complete destruction of the renal parenchyma or rupture of the renal pedicle. Kuster classifies them as follows: (1) rupture of the fatty capsule (2) rent in the renal substance, not reaching the renal pelvis, (3) rents which penetrate the renal pelvis (4) crushing of the kidney into bloody mass and (5) rupture at the hilum with integrity of the renal substance. Another group, not included in this classification, is subcapsular injuries, which produce a swelling of greater or lesser portions of the kidney and, since perirenal infiltration worthy of mention is absent, it is recognizable by an enlargement of the renal shadow.

The findings of plain and intravenous roentgenography are discussed. With plain roentgenography the abdomen may appear perfectly normal when the injury is subcapsular and there is no infiltration of blood present, in which case the renal outline is clearly shown. However, even under these conditions an enlargement of the kidney may be due to renal injury. The most characteristic and constant sign is the perirenal hematoma, recognizable by blurring of the renal and psoas contour which is more or less pronounced according to the amount of the hemorrhage, or when the hemorrhage is more marked capsular diffuse shadow in the renal area, which may reach below the iliac crest in extreme cases (Fig. 1). In most cases of perirenal infiltration of blood there is scoliosis of the lumbar vertebrae. There may also be diminished movements of the diaphragm and, possibly fluid in the pleura. Cilioic nictation is a frequent symptom in renal rupture especially with large retroperitoneal hemorrhages. The general picture is like that of pericarditis, with the difference that as a result of an inflammatory infiltration toward the flank, the subperitoneal fatty strip is indistinct with both retroperitoneal and intraperitoneal processes.

The most constant intravenous urographic finding is deformity or filling defect of the renal pelvis, which was observed in 1 of the 6 patients. It occurs both with and without hematomas. One or more calyces may be missing, contracted, or of irregular outline or the outline may be distinct and the central portions show large filling defect. These changes in outline may be due to coagula fill-

ing the renal pelvis or to pressure from blood and edema in the renal parenchyma or perirenal tissue and finally to rupture into the renal pelvis. Dilatations are due to coagula causing obstruction in the ureter. Another important symptom is the medial displacement of the upper portion of the ureter and the displacement of the junction of the ureter and renal pelvis upward and medially. If the rupture passes through the wall of the renal pelvis the presence of contrast medium outside of the renal pelvis is particularly characteristic of renal rupture. The differentiation between ruptures affecting the terminal calyces and those situated more distally is important because the first should be treated conservatively whereas the second require operation. Only the latter lead to perirenal urinary infiltration. It is, therefore, important to determine whether the contrast medium seen outside of the renal pelvis lies in the renal parenchyma or perirenally. Even ruptures with marked urinary infiltration of the renal parenchyma may heal spontaneously and perirenal urinary infiltration may recede spontaneously but this should not be relied upon.

The function of the injured kidney may be normal, diminished, or completely absent. One risk of intravenous urography is that excretion of the contrast medium is so deficient that the changes in the renal pelvis are not distinct. Experimental observations have also shown diminished function of the injured kidney. In actual practice this objection is not so significant as in the majority of cases the excretion of contrast medium is sufficient and the information that the renal function is impaired is valuable. Weaker contrast of the injured renal pelvis than contrast of the healthy kidney is not a significant finding of diminished function, as other factors may be involved, such as the greater or lesser ability of the renal pelvis to empty its contents also, coagula may give the impression of diminished excretion of contrast medium (Fig. 2). If the patient condition permits compression over the ureter should be employed in order to secure good filling. The examination should not be completed too soon especially when rupture of the renal pelvis or diminution of renal function is suspected. In isolated cases absolutely no excretion of contrast medium is seen, which indicates severe injury requiring nephrectomy.

Some authors ascribe the diminution of renal function to shock, while others deny this. Opinions are also divided regarding the condition of reflex anuria. The renal function may also be impaired by disease present before the injury.

Experimentally it has been shown that after a trauma the kidney retains its function according to the degree that functioning renal tissue is present and the circulation is maintained. The renal function seems to depend upon three factors: (1) the renal parenchyma, (2) the circulation, and (3) the patency of the ureter. This explains why, even with slight injuries, excretion of contrast medium may be entirely absent. In case no contrast medium is seen in the renal pelvis in the first examination while normal conditions or only slight changes are visible in the control examination, blockage of the ureter is probably the cause.

LOUIS NEUWELT, M.D.

Hammarsten, G. *Kidney Stones and Their Analysis* (Ueber Harnsteine und ihre Analyse). *Nord Med*, 1940, p. 1329.

The population of Sweden is fed mostly on meat and cereals whereas fruits and vegetables are diminished in the ration allowance. This naturally exerts an influence on the composition of the urine and the calculi formed in the urinary passages. The uric acid and phosphate stones are decreased while the oxalate and oxalate phosphate stones are increased. The physicochemical analysis of 504 stones of the urinary tract which were removed from inhabitants of south and west Sweden and examined at the Medico Chemical Institute at Lund revealed pure calcium oxalate stones in 28 per cent of the cases, calcium oxalate and earthy alkaline phosphate stones in 24 per cent of the cases, and calcium oxalate and uric acid stones in only 4 per cent of the

cases. Altogether these stones constituted 56 per cent of the entire number. In addition, calcium-oxalate formed a constituent of the nucleus of 7 per cent of other calculi which contained ammonium-magnesium phosphate.

The figures indicate the predominant rôle of calcium-oxalate in the formation of urinary calculi in Sweden. Many ammonium urate stones are considered primary in origin, and only 35 per cent of the entire number were the result of infection of the urinary tract.

For the study and investigation of stones the author presents and suggests a precise outline and the necessary chemical reagents.

(R. GUTZLITZ) JACOB E. KLEIN, M.D.

BLADDER, URETHRA, AND PENIS

Carson, W. J. *Tumors of the Penis*. *J. Urol*, 1940, 44: 307.

The author presents a short résumé of the literature on tumors of the penis and adds the case reports of 4 penile carcinomas. From a clinical and histological study of the cases observed, he concludes that the large number of lymphatics and their anatomical arrangement make the treatment of carcinoma of the penis analogous to cancer of the breast. The literature shows that the longest cures in each of these types of carcinoma are secured by radical surgical removal of the tumor mass with the surrounding lymphatics.

When the tumor has extended to the bulb, transplantation of the membranous urethra into the perineum is indicated. Since all palpable inguinal lymph nodes show infection, while approximately 50 per cent show metastasis, enlarged lymph nodes do not contraindicate surgery.

D. E. MERRAY, M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Paul, L. W., and Pohle, E. A. Solitary Myeloma of Bone; A Review of the Roentgenological Features, with a Report of 4 Additional Cases. *Radiology* 940, 35 65

The authors review a series of 43 cases of solitary myeloma of bone as recorded in the literature and report 4 additional new cases. Particular reference is made to the roentgenological features.

Although the study was conducted primarily from the roentgenological point of view, certain features in the clinical picture were considered worthy of note. There were 35 males and 8 females. Except for 1 infant nineteen months old, the age varied from twenty-nine to seventy-one years, the average being 48 years. More cases (6) occurred in the fifth decade. The thoracic spine (9 cases) pelvis (7 cases) and the femur (8 cases) were the most frequent sites of involvement. In 3 instances the lesion was found in the skull, in 5 in the humerus, in 3 in the cervical spine, in 1 in the lumbar spine and jaws, and single cases occurred in the clavicle, tibia, and sternum, respectively. In the pelvis, the ilium was the most frequent site of the tumor and in the femur the proximal part was involved in all 8 cases of this group. The duration of symptoms before the first observation varied from a few weeks to 40 years. The total period of observation varied from a few days to twelve years. In those patients in whom the disease became generalized the time from the first observation to the onset of generalization varied from two months to three years.

Roentgenologically speaking, two main types of lesion occur. The first is characterized by an osteolytic, multicystic-appearing area of rarefaction somewhat simulating giant-cell tumor. The lesion usually is sharply demarcated and centrally located in the medulla when occurring in long bone, and it may or may not expand the bone. The area of destruction is crossed by irregular and sometimes rather thick trabeculae. In some of the cases destruction of areas of the cortex as found but more commonly the cortex was intact. A periosteal reaction was produced. Pathological fracture was frequent. This multicystic type of tumor was often mistaken for giant-cell tumor.

The second type of lesion seen was a purely destructive one. This, too, was commonly located in the medulla and when in long bones, tended to extend up and down the shaft. The margins were sharply demarcated and expansion was present occasionally. The essential differences between this type of lesion and the cystic form in long bones were the absence of trabeculations and decreased tendency toward expansion. This osteolytic type was the one commonly encountered in the spine. It often began

in one body and later extended to adjacent bodies and appeared to cross the intervertebral discs. A proliferative bone changes were described.

The plasma-cell type of myeloma predominated, there being 41 cases of this form.

Treatment varied according to the size and location of the lesion. Surgery varied from biopsy and curettage to partial removal of the growth, complete resection, amputation, or disarticulation. Surgery was usually followed by roentgen therapy and it is believed that biopsy followed by extensive roentgen therapy offered the best chance of prolonging life. The authors used fractional doses of 200 roentgens at daily intervals until total dose of from 1,500 to 3,600 roentgens per field had been given. This was repeated if deemed necessary at later date. 1 cases with generalized involvement so-called general body exposure was administered with good response in some.

Five of the authors' own cases are reviewed in detail, all of which originated as solitary lesions. The patients in 4 of these had multiple lesions to death and another patient showed spreading of the original lesion when last seen. The 5 authors' last cases however had shown no tendency to spread when last seen, although neither had been followed up more than a year. F. HANSEN DOWNS, M.D.

Flemister, D. B. Changes in Bones and Joints Resulting from Interruption of the Circulation. Non-Traumatic Lesions in Adults with Bone Infarction; Arthritic Deformities. *Arch Surg* 940, 41 435.

The author reports additional cases of infarction and of secondary arthritis deformans due to blockage of the circulation in bones of adults, which indicates that the lesion is not uncommon.

Arteriosclerosis of the vessels of the extremities which results in marked degree of impairment of the circulation or in gangrene has received scant consideration as a possible cause of infarction of bone. Routine roentgen examination and section of all of the bones of the extremities amputated because of arteriosclerotic gangrene should be made for the purpose of establishing the frequency of such circulatory disturbances. Arteriosclerosis was a probable cause in one of the reported cases although direct proof is lacking.

Callos disease was the established cause in another of the reported cases and the nature of the osseous and articular pathological processes in callos disease was verified in 1 of the previously reported cases by studies of the head of the femur subsequently removed at operation.

That hypertrophic arthritis and bone infarction in some cases be due to common cause is suggested by their long association in cases presented. The cause of chronic hypertrophic arthritis is still



Fig 1 Aseptic necrosis in the head of the femurs, with a depressed sequestrum at weight bearing portion of the right head (y) and absorption of bone in the left head (x) Dull pain had been present in the right hip for eight months No symptoms were present in the left hip

very much in the dark Pommer considered the primary change to be a degeneration of the articular cartilage resulting from nutritional disturbance and the subsequent changes in both cartilage and bone ends to be due to weight-bearing and movement In some cases the nutritional disturbance is assumed to arise from the trauma of ordinary use in aging or senile cartilage In other cases changes in the underlying bone are known to precede changes in the cartilage These are well illustrated in the cases reported here This raises the question whether in other cases there are primary changes in the vessels of the subchondral bone, due to other causes, which result in nutritional interference and degeneration of the cartilage with subsequent hypertrophic arthritis, since most nutrition of the cartilage comes from the underlying bone The subchondral fibroplasia in the marrow spaces, bone sclerosis, and formation of cavities filled with fibrous tissue or fluid which are present in some cases are rarely associated with arteriosclerosis or with obliterative endarteritis of the vessels in the involved region

The following case of bilateral involvement is of special interest in that on one side the head broke down and in six years went through the usual changes, ending with deforming arthritis, while on the other side it retained its form, the necrotic area undergoing reconstruction without the development of arthritis In this case the indications are that on the right side the necrotic areas within the head included the entire upper portion and that absorptive changes within it so undermined and weakened the weight-bearing portion that it caved in On the other hand, the central area of necrosis of the left head neither involved the superior portion nor so weakened it that collapse resulted Consequently, with reorganization of the necrotic area the bone was restored practically to normal, and in the absence of extension of the process to the surface with necrosis of articular cartilage, arthritis deformans was not a sequel

One feature of this case, namely, the roentgen evidence of extensive absorption in the necrotic field of each head of the femur, suggests that some factor



Fig 2 Progression of the lesions two and one half years after Figure 1 was taken The right hip was continuously painful and stiff The left hip had lately been slightly painful on extensive use

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Paul, L. W. and Pohle, E. A.: Solitary Myeloma of Bone; A Review of the Roentgenological Features, with Report of 4 Additional Cases. *Radiology* 940, 35 63

The authors review series of 45 cases of solitary myeloma of bone as recorded in the literature and report 4 additional new cases. Particular reference is made to the roentgenological features.

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That hypertrophic arthritis and bone infarction may in some cases be due to common cause is suggested by their long association in cases presented. The cause of chronic hypertrophic arthritis is still

Abnormal trabeculations and sclerosis must be considered as a danger sign. When normal trabeculations and density have reformed in the absence of sequestra, indicating a healed osteomyelitic process, operations can be performed without danger of recurrence.

Operations for traumatic osteomyelitis. Secondary recurrent complications occurred in 28 per cent of the cases. The time of quiescence is not related to the recurrence. A six-month quiescent period is recommended by Watson-Jones before operation.

ROBERT P. MONTGOMERY, M.D.

Krogdahl, T., and Torgersen, O. "Uncovertebral Joints" and "Arthrosis Deformans Uncovertebralis," a Pathologico-Anatomical and Roentgenological Study (Die "Unco Vertebralgelenke" und die "Arthrosis Deformans Unco Vertebralis" Eine pathologisch anatomische und roentgenologische Studie) *Acta radiol.*, 1940, 21: 231.

Deforming spondylosis is characterized pathologically-anatomically by degenerative processes in the annulus fibrosus of the intervertebral discs as well as by reactive bone changes in the adjacent vertebral bodies with the formation of exostoses and subchondral sclerosis. The formation of exostoses is the predominant feature.

As the result of degenerative processes with cleft formations in the annulus fibrosus, especially in the peripheral parts of the latter, the expansive pressure of the nucleus pulposus exerts traction upon the longitudinal band in such a way that this, corresponding with the intervertebral disc and the adjacent marginal ridge, protrudes itself rigidly. When the vertebrae move against each other the disc is subjected to abnormal tuggings from the anterior longitudinal ligament. Reactive osseous changes in the form of exostoses are produced at its sites of insertion on the vertebral bodies.

While the roentgenological signs of the deforming spondylosis in the thoracic and lumbar portions of the spine fully correspond with the explanation of the localization of the exostoses, this does not seem to be the case with the cervical portion of the spine. Lateral exposures of the cervical portion of the spine also quite often show exostoses, which are chiefly localized posteriorly on the borders of the vertebral bodies and seem to penetrate into the spinal canal. Inasmuch as the anterior longitudinal ligament is considerably narrower in the cervical portion in comparison with the size of the vertebral bodies and the other portions of the spine, the exostoses must have another pathogenesis than the usual exostoses in deforming spondylosis. A priori, the exostoses cannot even be considered as the expression of a deforming spondylosis in the true sense, as they show no relation to the anterior longitudinal ligament. This frequent finding of so called posterior exostoses in cervical spondylosis induced the authors to investigate the nature, localization, and significance of these exostoses, and also to offer an explanation of the normal anatomy and roentgenology.



Fig. 1

The first effort was to determine whether the so-called "hemiarthroses" or "uncovertebral joints" are really normal anatomical formations or whether they should be considered as pathological phenomena. It was found that cleft formations occur normally in the lateral portions of the intervertebral discs in the cervical portion of the spine, and also that this cleft is circumscribed by a fibrous, capsule-like membrane. These cleft formations are to be strictly differentiated from the more medially located, irregular, and inconstant cleft formations, which are considered to be artefacts, especially when no signs of a degenerative process or other pathological changes in the intervertebral discs are visible. The justification for the designation of these connections as "joints" may be questioned because some of the characteristics of true joints are missing, but the term "uncovertebral joints" is retained because it has been generally accepted and because it, nevertheless, gives the best idea of the anatomical conditions.

In the frontal picture, the uncinate process appears distinctly laterally on both sides of the upper border of the vertebral body from the first thoracic to the third cervical vertebra, inclusive. The intervertebral cleft bends upward at the base of the process and simultaneously becomes narrower. The uncinate process stands out boldly both outward and against the roentgenological cartilaginous cleft, with a smooth contour without indentations or irregularities. It is important to observe that the outer border of the uncinate process normally lies more laterally than the border of the next higher vertebral body. The extent of the cartilage in the uncovertebral joint may normally vary considerably, but usually it amounts to a third or half of the height of the corresponding intervertebral disc. The cartilaginous cleft appears in the roentgenogram as almost wedge shaped, being broader medially than laterally.

In the lateral picture, it is seen that somewhat more than the posterior half of the clearing of the affected disc is covered by both of the uncinate processes, and that the posterior border of the prominence usually reaches somewhat more posteriorly than the rest of the vertebra. It is also seen that the marginal ridge does not course along the edge of the uncinate process, but along its base. This behavior indicates that the uncinate process must be considered as belonging to the transverse process,



Fig. 3. Roentgenograms taken twenty six months after Figure 1. The left hip as synostosis free and the density of the head restored almost to normal. The right hip as still painful and restricted in motion. The necrotic area (y) as mottled from creeping replacement by new bone.

ther the simple blockage of the circulation of the bone may have been active. The area of reduced density in the head of the left femur as not unlike that produced by the fibrous and cystic areas seen beneath the articular cortex of either the head or the acetabulum in cases of chronic hypertrophic arthritis, which again suggests an etiological relation with that condition.

There are two ways in which the usual type of osteochondritis dissecans differs from the formation of loose bodies associated with massive necrosis and consisting of articular cartilage and bone detached from the articular surface. In the first place the surrounding bone nearly always appears normal in the roentgenograms, which indicates that all of the bone which became necrotic had been detached, whereas in the case of massive necrosis of bone bordering on the joints, the weight bearing portion becomes detached while the relatively large remaining necrotic portion undergoes creeping substitution by atypical new bone which is demonstrable in roentgenograms. In the second place, the loose body in case of osteochondritis dissecans much less frequently becomes reattached in its bed and invaded and replaced by new bone than does the loose body formed in the presence of massive necrosis of bone bordering on joints. A case of necrosis of the humeral bone is presented.

There are numerous roentgenograms, photomicrographs, and reproductions of gross specimens, some of which are sectioned and roentgenographed, accompanying the article ROBERT F. MONTGOMERY, M.D.

Davis, J. E. Recurrence of Infection After Elective Operations in Cases of Healed Suppurative Infection of Bones and Joints. *Arch Surg* 90, 4 1910

Operative trauma such as that associated with arthrodesis, arthoplasty or osteotomy differs only slightly from closed external trauma. One should, therefore expect some recurrence of infection in healed suppurative lesions of bones and joints in the event of operation. The complication of recurrence

is a major fall and should be avoided whenever possible. The length of time that the infectious process has been quiescent has no relation to the recurrence of infection. A total of 5 operations on healed suppurative areas in bones and joints from the service of Arthur Steinbinder is the basis for this report.

Operations for gonorrheal arthritis. All of the operations are done directly into the old healed articular areas and all included work on bone yet, in spite of this and the fact that in some instances the areas had been healed for only six months, there are no recurrences of infection. Gonorrheal arthritis, once it is healed does not recur after operative trauma. Solidification of the acute infection and return to the normal alveolar state for period of six months should be sufficient interval.

Operations for suppurative arthritis. Pure suppurative arthritis, when healed recurs in only 3 per cent of cases when operation is performed through the previously involved area. The recurrent bacterium was the staphylococcus in 5 cases and the streptococcus in 1 of total of 48 cases. Operations done near but not through the area of suppurative arthritis showed an 8 per cent frequency recurrence of the infection and much shorter period of secondary healing.

Operations for hematogenous osteomyelitis. The recurrences are preponderantly staphylococci and amount to 46 per cent when the operation is performed through the previously involved area and 15 per cent when done in close proximity to it but not through the previously involved bone. By careful analysis of the roentgen appearance of healed osteomyelitis it is possible to anticipate such infections will recur in the event of surgical intervention. The use of magnifying lens to disclose sequestra that could not be observed on less detailed search emphasized.

The presence of sequestra in the operative field is indicative of recurrent infection. Recurrence was found in all of the 5 cases that were operated upon.

The literature dealing with the xanthomas of the semilunar cartilage (Speil, Mathey, Biebel) and the "Babylonian" classification mixup of these tumors, which cannot possibly be properly classified without further effort, are discussed. The author differentiates 3 types of formation:

- 1 Lipophagous xanthogranuloma, which is to be regarded as a metaplastic or resorption granuloma of the injured portion of the fat tissue of the knee joint

- 2 Giant-cell blastoma of the knee joint, which has undergone true xanthomatous changes, and because of the continuous activity of the joint, there is a deformed and secondarily altered tumor in which xanthomatous deposits have formed as a result of destruction and resorption of the cells. This must be strictly differentiated from true sarcoma, it assumes an intermediate position between fibroma, to which it is closely related, and sarcoma

- 3 A combination of a true giant-cell blastoma and angioblastoma with secondary xanthogranulomatous formation developing around traumatic or spontaneous tumor necrosis, or around nests of cholesterol crystals acting as foreign bodies

Following these introductory considerations, the author reports an observation of his own which deals with a meniscus lipoma, the clinical history and an illustration are presented.

A twenty-three-year-old female salvation army officer, who had previously been well, experienced a severely painful crackling sensation on the medial aspect of the knee joint while riding a bicycle uphill. Following this, there remained persistent signs of locking and limitation of extension of the knee. While the knee was held in flexion at 120 degrees, a marked knocking could be felt and heard at the level of the medial aspect of the fissure of the joint and at the same time a tumorlike cartilaginous mass protruded from the depths of the joint space, this tumor disappeared on further flexion. Severe tenderness on pressure was elicited over the medial aspect of the knee joint, and the Steimann rotation sign was markedly positive in this region.

In the roentgenogram the medial knee joint fissure was somewhat widened beyond the normal, and in addition to this there was a questionable shadow in the region of the outer semilunar cartilage. Upon opening of the knee joint through a medial arthrotomy incision, there was encountered at the anterior end of the medial meniscus, a lipoma about the size of 4 cherries divided into 3 or 4 main lobules, this lipoma was situated upon the outer and upper surface of the meniscus, was firmly fastened to the latter, and, upon flexion and hyperextension, was drawn in toward the joint and became firmly wedged in the latter. The meniscus, which was attached in a normal manner at its anterior and posterior point of anchorage, showed a longitudinal split in its posterior two thirds, as a result of which, the fragment, which remained connected with the meniscus in its posterior end, projected into the joint space. The meniscus together with the lipoma was removed.

Postoperative convalescence was uneventful. After three months, the patient was able to carry out extension up to 180 degrees, active flexion to 90 degrees, and passive flexion to 70 degrees.

Histologically, in the region of the macroscopic tear, there was seen a swelling of the tissue. However, there was no evidence of foci of necrosis. The surfaces of the tear were covered by a flat endothelial-like layer of cells, as if a new formation of synovial epithelium had taken place in this region. The deeper layers of the surrounding tissue showed no noteworthy changes. There were numerous blood vessels of recent origin at the base of the meniscus at the point of transition to the synovial membrane, characterized by a prominent endothelium. The synovial membrane in many instances was very cellular. The fatty tumor consisted of loose, adipose tissue with occasional connective-tissue strands, its construction was slightly lobulated, the superficial surface was covered by the usual synovial tissue.

The first and only finding of a meniscus lipoma, and the pathological relationship between the tumor and the spontaneous rupture of the involved meniscus, are emphasized. The fat tissue presents a favorable medium for the development of lipomas, the initial recognition goes back to an observation of Beckels at the end of the 18th century, a condition which should be differentiated from the traumatic inflammatory proliferation of the so-called Hoffa's fat body. As far as synovial membranes are concerned, according to Hammar, a cell rich and cell-poor type are to be distinguished, in the former type, according to Petersen, folds of fat of extremely variable form and size are found, whose convolutions are very similar to the muscle fiber distribution in the walls of comparatively large arteries. In the niches between these folds we encounter whole forests of synovial cells which provide, on the one hand, for the mucous membrane healing of the joint, and on the other, for the nourishment, oxygen supply, the production of heat, and the resorption of waste material. The subsynovial membrane, which up to the age of thirty is extremely cellular, loose, and markedly permeated with connective-tissue fibers, begins to sclerose after the age of forty-five because of the disappearance of the loose fat-containing tissue. In commenting on the fat in the semilunar cartilage, the author mentions the work of Tobler and Wallenheimo, according to whom the occurrence of fat droplets in the menisci is quite frequent. The author is not in accord with the assumption of Wallenheimo, that the fat infiltration in the cells of the superficial layer of the meniscus, which is already present at the age of puberty, disappears as the result of degenerative changes in later life. According to Henschel's opinion, the explanation for this finding is based upon a metabolic phenomenon whereby the fat infiltration is supposed to represent a nutritive material of an inferior grade which takes the place of the used up tissue carbon of the cell glycogen which represents the best type of nourishment, this process, therefore, is not regarded as a choking-off

and the roentgenological observation also supports the theory that the uncinate process is a counterpart of the head of the rib in the thoracic portion.

Oblique projections show in agreement with the anatomical conditions, that the medial anterior limitation of the intervertebral foramina are not formed, as in the other parts of the spine, by the intervertebral discs and the adjacent portions of the vertebrae, but by the uncinate process and the borders of the uncovertebral joint. The foramina are considerably larger than in the thoracic vertebrae with a diameter of about 1 mm. Their form is usually oval (nearly quadrangular with rounded angles) with the longest axis placed vertically. The lower half is usually somewhat smaller than the upper. The border is smooth, without marked projections. The posterior lower portions of the intervertebral disc of the opposite side may be projected anteriorly into the foramen and there stimulate exostoses. The lighter shadow of the vertebral arch is projected into the foramina to greater or lesser extent.

The pathologico-anatomical findings are summarized as follows.

The uncovertebral joints very often form the site of deforming processes with the formation of exostoses. When these are localized in the posterior portion of the joint, they may produce a constriction of the intervertebral foramen. If the exostoses are situated somewhat more anteriorly the vertebral canal with its contents may be affected.

The roentgenological signs of arthrosis deformans in the uncovertebral joints are on the whole similar to those of arthrosis deformans in general. A frontal exposure offers a good view of the changes and shows that the extent of the cartilage is diminished and that the signs of subchondral sclerosis vary to some extent. It is often striking that the upper part of the uncinate process appears evenly flattened, which gives the cartilaginous cleft a more transverse course. The most important sign is the formation of exostoses. In the frontal picture these are circumferential, and usually most markedly so at the upper border of the joint. These upper exostoses often have the typical beak or claw shape as they project over the uncinate process. However even with relatively slight changes, the exostoses not rarely cause the upper joint border to appear as reaching more laterally than normal. The authors believe that this finding in the more doubtful cases deserves diagnostic importance. In the lateral exposure the exostoses are visible posteriorly according to their position against the most posterior part of the intervertebral foramen and the adjacent portion of the spinal canal. The posterior projection assists in determining the influence of the exostoses upon the intervertebral foramina. The important relation of the uncovertebral joint to the vertebral artery and nerve cannot be demonstrated roentgenologically. The exostoses on the more anterior portions of the joint are best reproduced in the frontal exposure, partly also in the oblique exposure, whereas in the lateral exposure they are not pro-

jected clearly. If in each case the exostoses are not very small, it may be concluded that the vertebral canal is constricted. Conversely exostoses which are localized around the posterior portions of the joint are circumscribing in the lateral exposure posteriorly and in the oblique exposure against the intervertebral foramen, whereas in the frontal exposure they are not visible at all or only barely perceptible. If circumscribing exostoses are seen in all three projections it may be concluded that they are localized round the entire circumference of the joint edges. These changes are found most often in association with spondylosis deformans but may appear also in one or several uncovertebral joints without simultaneous signs of anything else being definitely abnormal.

The authors believe that the deforming process in the uncovertebral joints is the causative agent responsible for Barré's "posterior cervical sympathetic syndrome."

LOUIS VERNLEY, M.D.

Henschen, G. Meniscus Lipoma as the Indirect Cause of an Attraction Myelopathy Leading to Spontaneous Rupture. Monographic Study concerning Tumors of the Semilunar Cartilage of the Knee (Meniskallipom als indirekte Ursache einer spontanen Ruptur des Kniegelenksknorpels. Monographische Studie über das Gewebeleben der Menisken). *Zentralblatt f. Chir.* 1940, p. 76.

Tumor formations of the semilunar cartilages of the knee joint have until now been rarely observed. Evidently the tissue of the semilunar disc which has been designated by the anatomist as cartilaginous tendon, forms a poor soil for the development of tumors. Aside from this, any tumor which might arise would be destroyed in its incipency by the mechanical forces acting upon the meniscus joint. If the latter are between 1 and 2 millibones. This fact also explains the more frequent occurrence of blastomatous growths in the parameniscular tissues (in the synovial and fibrous knee joint capsule and in the paracapsular tissues). The benign tumors are the lipomas, fibromas, gangliogliomas and neuromas, osteomas, myxomas, cystic xanthomas, lipoid angiomas, and hemangiomas, while the malignant are the sarcomas, peritheliomas, and endotheliomas.

True meniscus tumors are rare. The author could gather only the following observations.

An intra-articular fibroma of the right external semilunar cartilage (Bruna) - rooster comb shaped fibroma of the anterior border of an otherwise normal internal semilunar cartilage (Kott) - polycystic fibroma firmly fixed to the lateral semilunar cartilage (Serafini) (in this case according to our present views, the author as dealing with fibrosynovial cyst of the semilunar cartilage coincidental with benign xanthomatous giant-cell tumor (Pauli Zeeh-Christen) - xanthomatous giant-cell tumor arising from the femoral surface of the normal semilunar cartilage (Tobler) - an angio-endothelioma, a xanthomatous giant-cell tumor of the right medial semilunar cartilage (Hepper Elchbaum).

The literature dealing with the xanthomas of the semilunar cartilage (Speil, Mathey, Biebel) and the "Babylonian" classification mixup of these tumors, which cannot possibly be properly classified without further effort, are discussed. The author differentiates 3 types of formation:

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In the roentgenogram the medial knee joint fissure was somewhat widened beyond the normal, and in addition to this there was a questionable shadow in the region of the outer semilunar cartilage. Upon opening of the knee joint through a medial arthrotomy incision, there was encountered at the anterior end of the medial meniscus, a lipoma about the size of 4 cherries divided into 3 or 4 main lobules, this lipoma was situated upon the outer and upper surface of the meniscus, was firmly fastened to the latter, and, upon flexion and hyperextension, was drawn in toward the joint and became firmly wedged in the latter. The meniscus, which was attached in a normal manner at its anterior and posterior point of anchorage, showed a longitudinal split in its posterior two thirds, as a result of which, the fragment, which remained connected with the meniscus in its posterior end, projected into the joint space. The meniscus together with the lipoma was removed.

Postoperative convalescence was uneventful. After three months, the patient was able to carry out extension up to 180 degrees, active flexion to 90 degrees, and passive flexion to 70 degrees.

Histologically, in the region of the macroscopic tear, there was seen a swelling of the tissue. However, there was no evidence of foci of necrosis. The surfaces of the tear were covered by a flat endothelial like layer of cells, as if a new formation of synovial epithelium had taken place in this region. The deeper layers of the surrounding tissue showed no noteworthy changes. There were numerous blood vessels of recent origin at the base of the meniscus at the point of transition to the synovial membrane, characterized by a prominent endothelium. The synovial membrane in many instances was very cellular. The fatty tumor consisted of loose, adipose tissue with occasional connective tissue strands, its construction was slightly lobulated, the superficial surface was covered by the usual synovial tissue.

The first and only finding of a meniscus lipoma, and the pathological relationship between the tumor and the spontaneous rupture of the involved meniscus, are emphasized. The fat tissue presents a favorable medium for the development of lipomas, the initial recognition goes back to an observation of Bechels at the end of the 18th century, a condition which should be differentiated from the traumatic inflammatory proliferation of the so called Hoffa's fat body. As far as synovial membranes are concerned, according to Hammar, a cell rich and cell-poor type are to be distinguished, in the former type, according to Petersen, folds of fat of extremely variable form and size are found, whose convolutions are very similar to the muscle fiber distribution in the walls of comparatively large arteries. In the niches between these folds we encounter whole forests of synovial cells which provide, on the one hand, for the mucous membrane healing of the joint, and on the other, for the nourishment, oxygen supply, the production of heat, and the resorption of waste material. The subsynovial membrane, which up to the age of thirty is extremely cellular, loose, and markedly permeated with connective-tissue fibers, begins to sclerose after the age of forty-five because of the disappearance of the loose fat-containing tissue. In commenting on the fat in the semilunar cartilage, the author mentions the work of Tobler and Wallenheimo, according to whom the occurrence of fat droplets in the meniscus is quite frequent. The author is not in accord with the assumption of Wallenheimo, that the fat infiltration in the cells of the superficial layer of the meniscus, which is already present at the age of puberty, disappears as the result of degenerative changes in later life. According to Henschler's opinion, the explanation for this finding is based upon a metabolic phenomenon whereby the fat infiltration is supposed to represent a nutritive material of an inferior grade which takes the place of the used-up tissue carbon of the cell glycogen which represents the best type of nourishment, this process, therefore, is not regarded as a cholesterolemia.

of the tissues but fat but rather as a type of nourishing food stuff which is supplied to the tissues in accordance with the new type of functional or formative demands made upon the latter.

The problem of the occurrence of true fat tissue in the marginal region of the meniscus or of the parameniscular zone of tissue has not yet been clarified. According to Wallenbom especially in females between the ages of twenty and twenty-six, the apical third of the meniscus and the parameniscular tissue still appear very cellular just as in childhood, so that there might still be room for the heterotopic embedding of lipomas or lipoblastic bodies which have become separated from their original separation (deposition of fat cells)—Fleming primitive organs—Hammar. In view of the foregoing we deal with so-called heterotopic lipoma in the case at hand, i.e., with the development of fat in place where normally no fat tissue occurs.

True lipomas have been observed in the knee joint as being subsynovial and outside of the joint,

lipomas of the joint projecting out of the joint and as subsynovial and within the joint (Druant Berger Otterbeck) Schwartz found 34 kgm. lipoma of the knee joint. Lipomas of the fibrous capsule and the paracapsular layers of fat, arising from aberrant fat anlagen are more seldom observed. The case described has certain parallelism with the broad-based egg-sized lipoma of the crucial ligament found in operation by Herrold.

The etiological relationship between the occurrence and presence of these meniscus lipomas and the development of meniscopathy which predisposes to tearing of the meniscus is based upon the interference with the gliding freedom and gliding ability of the semilunar cartilage by the lipoma which may firmly anchor the anterior half of the internal semilunar cartilage. As a result the physiological gliding motion and the ability of the meniscus to draw together to form smaller arcs is made impossible, and the meniscus is caught as if between millstones then, due to attrition, the meniscopathy which predisposes to tearing of the meniscus arises.

(Title) HARR V SALER NY NY MD

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Steindler A., and R. H. C. W. The Conservative Compensation-Derotation Treatment of Scoliosis. *J Bone & Joint Surg* 34 3 67

Since in most cases of scoliosis it is impossible to secure anatomical restoration, measures which realign the spine by compensation—balancing the head and shoulders over the pelvis—are acceptable as a compromise. If decent musculature is available to maintain balance, satisfactory results can be obtained. In the absence of such muscle power fusion is required.

The cases are grouped into five types.

Those which compensate spontaneously and maintain their correction during the period of rapid

growth and after adolescence. These are about 30 per cent of the total.

2 Those in which compensation can be secured conservatively and in which adequate muscle tone can be developed to maintain correction. The majority of slight and moderate habitual and rachitic scolioses belong in this group.

3 Those in which adequate compensation can be maintained, and in which adequate muscle power can be developed, but in which compensation is likely to break down because of marked adaptive or congenital osseous changes. This group, including the more severe progressing habitual types and the congenital cases, probably should be fused.

4 Those in which alignment is possible, but muscle power is inadequate. These include most paralytic cases and probably should also be fused.

5 Those which cannot be adequately realigned because of severe structural deformity. This group comprises the most severe congenital cases, severe habitual scolioses, severe paralysis, and severe cervico-thoracic rachitic scolioses. If the curvature is progressing, fusion should be done. If stable it should be left undisturbed or treated by support.

Treatment consists of systematic development of muscle tone and improvement of the mechanical efficiency of the muscles by symmetrical and asymmetrical exercises to develop the back, abdominal, and shoulder muscles, with the formation and maintenance of compensatory curves. During the period of muscle development a brace is applied to safeguard the maintenance of posture until the muscles are strong enough to hold by their own power.

If forced compensation is obtained by the use of wedge-cast, fusion must be done to hold the correction. The authors further state that rotary deformity of the thorax cannot be corrected by any of our present methods of treatment.

D. H. LEVINTHAL, M.D.

Hackenbroch, M. Operative Treatment of Certain Types of Arthritis Deformans of The Hip Joint. Critical Discussion of the Problem of Drilling the Femoral Head and Arthrodesis (Zu operativen Behandlung bestimmter Formen von Arthritis deformans des Hüftgelenks. Zugleich kritischer Beitrag zur Frage der Trennung des Schenkelkopfes und der Pfannenexstirpation) *Ztschr f Orthop* 94, 7 38

Disturbances in arthritis of the hip may be due to poor posture (pains due to exhaustion) to insufficiency of the cartilage (arthritic pains, particularly after considerable rest) and also to defects in the bone structure. Among the last the author considers the most serious to be certain non-inflammatory areas of rarefaction which are of congenital or embryonic origin and are combined with the occurrence of certain static-dynamic defects.

When the usual operative procedures fail (subtrochanteric osteotomy Duverney's drilling of the neck of the femur resection) the cause usually is

failure to determine the precise cause of the difficulty which has been the primary indication for the surgery. In the cases with pure bone disturbances drilling of the femoral neck or arthrodesis may be most successful. The arthrodesis has the biological purpose of rebuilding the stability of the joint rather than the prevention of a further subluxation. Drilling of the femoral neck is a direct stimulus to the development of reconstruction changes in the head of the femur. This type of surgery is particularly suited to older people, since it is readily performed and the hip joint becomes functional after three weeks without any further need of plaster casts. The localization of the pathology in the acetabulum is indication for arthrodesis, whereas alterations in the femoral head are indication for surgery on the neck of the femur. Both procedures may be combined, also, the arthrodesis may be combined with a sub trochanteric osteotomy. (SIEVERS) JACOB E. KLEIN, M.D.

FRACTURES AND DISLOCATIONS

Troell, A., Lauritzen, G., and Möller, A. Fractures of Apparently Healthy Bone Without a True Accident. *Acta chirurg Scand*, 1940, 84, 226.

Spontaneous fracture of apparently normal bone in 6 patients is described and the probable etiological factors are enumerated and discussed. An impacted fracture of the radial neck occurred in an eleven-year-old girl while she was sewing. No history of severe muscular effort or trauma in any form could be obtained, but this history was subject to question. Definite external trauma at a later date resulted in a fracture, not through, but closely adjacent to the original fracture site.

Fracture of the ulnar diaphysis occurred in 2 young women who gave an identical history of experiencing sudden, sharp pain in the forearm while pitching hay. A fracture of the lateral malleolus of the right tibia occurred in a middle aged man while he was attempting to lift an extremely heavy weight. Fractures of spinous processes about the cervico-dorsal region occurred in 2 younger men, 1 of these patients noted the onset of upper back pain while shoveling snow while injury in the other occurred while he was excavating with a crowbar. There was no history of external violence in any case, and in none of the 6 patients was there roentgenological or clinical evidence of either local or systemic disease.

The authors believe that spontaneous fractures may be classified under three groups: (1) spontaneous fractures due to insufficiency of phosphorus and calcium in the skeleton, (2) spontaneous fractures as a complication of tetanus convulsions following metrazol therapy of the insane, (3) fractures caused by, or occurring in connection with, violent muscular action. All but the first of the 6 cases cited were placed under the third classification. No explanation was offered for the radial neck fracture in the first patient.

In conclusion it was stated that fractures may occur in almost any healthy bone of persons who,

exposed to exacting work or fatiguing labor, attempt unaccustomed or unusual exertion.

HOMER PHEASANT, M.D.

North, J. P. The Conservative Treatment of Fractures of the Humerus. *Surg Clin North Am* 1940, 20, 1633.

The author discusses briefly the treatment of fractures of the upper end of the shaft of the humerus. In fractures of the surgical neck with little or no displacement, the use of a sling and swathe is advised. The importance of early active motion, begun gradually four or five days after the injury, is stressed. Fractures of the surgical neck with considerable displacement may result in excellent functional results even though reduction is imperfect. If reduction can be accomplished, the arm can usually be brought to the side and maintained in a sling and body swathe. A plaster abduction spica cast may be required. Occasionally balanced traction may be employed.

In the treatment of shaft fractures, the Caldwell hanging cast is recommended. The author recognizes that the method is unorthodox since it does not immobilize the proximal fragment, but states that it works in actual practice despite flagrant violations of the accepted principles.

DANIEL H. LEVINTHAL, M.D.

Hinton, D., and Steiner, C. A. Fractures of the Shaft of the Radius and Ulna. *Surg Clin North Am*, 1940, 20, 1669.

This article concerns itself with simple fractures of the forearm which are not displaced or are reducible by manipulation. For general anesthesia the authors prefer vinylene, except in fluoroscopic reductions for which gas-oxygen is used. Immobilization is maintained by anterior and posterior splints.

For fractures of the radius above the insertion of the pronator teres, the supinated position is employed, while fractures at a lower level are healed in midpronation. Splints are removable for the early institution of physical therapy.

DANIEL H. LEVINTHAL, M.D.

Manges, L. C., Jr. Fractures of the Lower End of the Radius (Colles). *Surg Clin North Am*, 1940, 20, 1683.

In this discussion of Colles' fractures, Manges stresses particularly the importance of the radio-ulnar articulation. In a concise description of the anatomy he reviews the salient features and includes the ligamentous structures as well as the bony ones. Taylor and Parsons' classification is employed, namely:

1. Fractures with the triangular ligament intact
2. Fractures with loss of integrity of the radio-ulnar joint
 - (a) Rupture of the triangular ligament
 - (b) Avulsion of the ulnar styloid
 - (c) Severe comminution of the lower end of the radius

The use of general anesthesia is recommended for reduction, the author believing that local anesthesia has not been satisfactory. In fractures without displacement, he employs a short molded posterior splint with the wrist in neutral position. For fractures with displacement but with an intact triangular ligament, reduction is maintained by a short posterior plaster splint with the wrist in fairly cute flexion. For fractures with disturbance of the radio-ulnar articulation the wrist must be held in strong ulnar deviation as well as flexion and an anterior molded splint is advocated in addition to the posterior plaster. Early active motion is desirable.

When these cases are efficiently handled, the prognosis is good. However from a review of several reported series the author finds that poor results are obtained too frequently which indicates that this fracture is being handled either carelessly or inadequately.

Reversed Colles fractures are reduced by procedure practically reversed to that used for Colles fractures. Hyperextension of the wrist is to be avoided. Epiphyseal separations of the lower end of the radius are handled in much the same manner as typical Colles fractures. Repeated manipulations are to be condemned since they may result in destruction of the growth cartilage of the epiphysis.

DUNCAN H. LEVINSKY, M.D.

Barr, J. S. Fracture of the External Tibial Condyle. *J. Am. Med. Ass.* 1940, 5, 663.

Fracture of the upper end of the tibia has been recognized as an extremely serious injury not because of non-union, which rarely if ever occurs, but because it involves a weight-bearing joint and the risk of loss of normal knee joint function. The degree of displacement of the fractured fragments is the key to rational treatment. In cases with minimal displacement, the author's method is immobilization in a carefully molded plaster cast or splint, or in a Thomas splint with a Pearson attachment and with the knee in slight flexion until the swelling of the joint has subsided. This usually requires from one to two weeks. Daily physical therapy is then instituted. Gentle active movement of the knee always within the limits of discomfort, is added to this within another week or two.

Cases with moderate displacement were the ones presenting displacement of fragments from $\frac{1}{4}$ to $\frac{1}{2}$ in. The author treated 3 of these cases conservatively. One patient was treated by closed manipulation and 3 were subjected to open operation. After a year of follow-up study he is not ready to express favor for either form of therapy and believes that the ultimate preference will depend upon the cases which develop instability, pain, and degenerative joint changes.

The third group of cases, numbering 8 in the author's series, had displacement of fragments amounting to $\frac{1}{2}$ in. or more as estimated from the roentgen ray appearance. These cases must be sub-

jected to open operation. If the condition is unrecognized or deliberately left unreduced, the result is a painful weak knee which upon examination shows marked abnormal lateral mobility increasing knock-knee deformity and hypertrophic changes which occur as time elapses. Manipulation cannot possibly affect anatomical reposition of the joint surface of the tibia.

The operative technique calls for a bloodless field. The incision begins 1 in. lateral to the superior pole of the patella and extends down and just lateral to the tibial tubercle then curving outward. It ends at a point 1 in. below the joint line just anterior to the fibula. The joint is then carefully inspected through longitudinal incision in the capsule just lateral to the patella. In order to visualize the extent of the fracture it is usually necessary to remove the external semilunar cartilage. Afterward, the whole articular surface of the outer condyle of the tibia is usually exposed. Subperiosteal stripping of the common origin of the extensor muscles from the anterolateral surface of the tibial condyle will expose the longitudinal fracture. Depressed fragments of articular cortex with cartilage attached may be replaced by means of a blunt dissector or a bone grasping forceps. In some instances additional bone chips removed from the tibial shaft may be packed beneath the replaced fragments. The articular cartilage of the tibial condyle should present after this step a smooth anatomical restoration of normal contour. Without this the operation is a failure. The lateral fragment is then replaced snugly so that it locks the other fragments in a snug-as-a-pony-fashion. The most satisfactory method of securing anchorage of this fragment is by bolting Sherman screw with washer over the head and nut on the free end. After the sutures are removed and the postoperative reaction has subsided the same program is carried out as for fractures with minimal displacement. The screw is not removed unless it shows signs of bone absorption, although the author believes that all metal should be out of the joint one year after its introduction.

A. THORNTON F. 84, A, M.D.

Ahlberg, A. Review of 111 Cases of Fracture of the Calcaneum, with Especial Reference to Injury of the Talocalcaneal Joint (Studien über nach versehrte Calcaneus- und Calcaneusfrakturen unter besonderer Berücksichtigung der Gelenksveränderungen zwischen Talus und Calcaneum). *Göteborgs Läkartidning*, 94.

About 60 patients with fractures of the os calcis were observed between the years 1934 and 1937 but only one could be followed up. Eleven of these had bilateral injuries. Sixteen, or 14.4 per cent, were women with an average age of forty-five and three-tenths years and 95, or 85.6 per cent were men, with an average age of forty-three and six-tenths years. All of the bilateral fractures occurred in men. The fractures are divided into three groups according to the severity of the injury: (1) fractures of the process of the os calcis without involvement of the joint (7

cases, 13.9 per cent), (2) fractures, fissures, or fracture lines which involve the talocalcaneal joint, but in which there is little or no displacement of the fragments (10 cases, 8.2 per cent), and (3) fractures which directly or indirectly have caused a derangement of the joint (95 cases, 77.9 per cent). In 26 cases (23.4 per cent) the fracture of the os calcis was associated with other fractures but only 5 times with vertebral fractures. Five fractures were compound, the other 117 were simple. The simple fractures were treated as follows: 43 with bed rest (with or without splints), 48 with plaster casts (with or without reduction), 12 with traction, 5 with compression by means of Boehler's os-calcis clamp, 3 with reduction according to the method of Boehler, 1 by reduction according to Westhues, 1 by open reduction, and 1 with reduction according to the method of Lenormant and Wilmoth. Most of the patients had plaster casts in later treatment, and, in addition, passive and active exercises, massage, and diathermy, in most of the cases supporting inner soles were ordered. The average duration of treatment amounted to thirty-eight or thirty-nine days for the unilateral single fractures, and eighty-six or eighty-seven days for the bilateral fractures, an average of fifty-eight or fifty-nine days, and the complete duration of economic disability was from five and three quarters months to six and one-half months for the insured patients, and four and one half months for the others. In the bilateral os calcis fractures the average duration of economic disability was seven and one-half months. As to complications there was 1 necrosis of the skin and 1 pulmonary embolism. With the cases arranged according to severity the patients in Groups I and II were disabled economically for an average of three months, and those in Group III for an average of five and one-half months. No complete anatomical reduction was procured in the 91 fractures of Group III. With regard to the early results, 45, or 49.4 per cent, of the cases showed a joint angle which was 0 degrees or negative, and only 7 showed an angle of over 20 degrees. Dorsiflexion was absent in 8 of the 37 older patients and in 3 of the 27 younger patients and it was under 20 degrees in 28 of the older patients and in 14 of the younger patients. Plantar flexion was under 30 degrees in 8 patients of the younger group and in 13 of the older group. Of interest is the fact that in the late results pronation and supination had become worse in 56.6 per cent of the cases in which these movements could be compared with the early results. Pronation was improved in only 10 per cent of the cases and supination in 16.7 per cent, while they remained unaltered in 33.3 per cent and 26.7 per cent, respectively. Special methods of measuring the movements of the ankle joint are described.

In the follow-up studies, which extended from over nine months to thirteen and one half years, the following late results were found:

Among 119 patients with single fractures there were 19, or 21 per cent, of Groups I and II who had

normal motion as compared with the healthy foot, in 39, or 32.8 per cent, the motions were hampered, in 41, or 34.4 per cent, both pronation and supination were restricted, and in 14, or 11.8 per cent, there was neither pronation nor supination. In Group III, 6, or 6.4 per cent, had normal motion, 39, or 42.4 per cent, were hampered, in 37 both pronation and supination were limited, and in 10, or 10.9 per cent, either pronation or supination was limited.

In the older patients the figures were uniformly less favorable than in the younger ones. Seventy-five patients, or 67.5 per cent, returned to their previous jobs, 29, or 25.2 per cent, had to take lighter work or change their jobs, 7 did not resume work again. Of the last, 2 had concomitant knee injuries, 1 had a vertebral fracture, 3 were prematurely pensioned off, and 1 was financially independent.

Of the insured patients, 16, or 23.9 per cent, were receiving no compensation at the end of their period of economic disability, and 28, or 40.8 per cent, were receiving none at the completion of the follow-up study. Thirteen, or 40.6 per cent, of the patients of the younger group and 15, or 42.8 per cent, of the older group received long-term compensation, and this in the former group amounted to from 10 to 15 per cent in 8 cases and from 20 to 35 per cent in 5 cases, in the older group from 10 to 15 per cent in 6 cases and from 20 to 60 per cent in 9 cases. Only 3 patients with single fractures of the os calcis were concerned with compensation, whereas all of the other patients had suffered multiple fractures. In addition, there are in this work innumerable proofs of the existence of flat, pronated, and flat-pronated feet, of varus and adduction deformities of the foot, also of bony projections below the ankle, shortening of the height of the malleolus from the ground, change in gait, muscle atrophy, inability to stand on tiptoe, pain on weight bearing, disturbances of sensation, roentgenological deformities of the os calcis, bone atrophy, and long duration of subjective discomfort. In a small group of cases it was attempted to improve the results of the initial treatment by secondary measures. Periarthral injection of 1 per cent aethocain was unsuccessful, arthrodesis of the lower ankle joint, on the other hand, is to be heartily endorsed in cases of longstanding pain.

(WERNER BLOCK) RICHARD WARREN, M.D.

Ahlberg, A. The Results of Treatment in the More Severe Fractures of the Os Calcis (Ueber die Behandlungsergebnisse bei schwereren Fersenbeinbruechen). *Acta chirurg Scand*, 1940, 84, 187.

Numerous methods of treating fractures of the os calcis have been proposed and used with more or less success but no one method has been found to be ideal. The experience and the skill of the individual surgeon seem to play an important part, both as regards the selection of suitable cases and the carrying out of the treatment, and the best results are probably achieved by an individual combination of different methods of treatment.

The author has followed 121 cases with 122 fractures of the os calcis, of which 95 fractures in 83 patients are discussed, namely those of the more severe sort with direct or indirect involvement of the posterior talocalcaneal joint and dislocated fragments, corresponding with Groups V to VIII of Boehler classification. In well over 60 per cent of the cases the follow-up examination was made five years after the accident. In none of the cases was complete anatomical restoration to be noted, not even when active therapeutic measures had been undertaken. The mobility in the lower ankle joint could be considered normal in only 6 cases on follow-up examination. In the other cases it was either absent or limited. It can also be stated that the mobility seems independent of whether the joint surfaces have become anatomically restored or not. For years numerous patients had had painful symptoms after the accident, and as a rule they were apparently due to injuries of the joint. The changes to the joints occasioned by the fracture seem to develop irrespective of the therapeutic methods, according to the nature of the fracture. The author agrees with those authors who, after earliest possible reduction perform subastragaloid arthrodesis from four to five months after the accident, the event that the symptoms persist.

The symptoms that indicate joint changes include pains on walking on uneven ground, missteps and imbalance of the foot pains when attempting forced motions of the lower ankle joint, and stiffness of the foot after rest. The character and localization of the symptoms are also important. It is not surprising that a joint which must bear the weight of the whole body reacts painfully when it must function

Even though protruding portions of bone plantar as well as that below the ankle are of some degree of significance for the permanent symptoms they deserve only secondary consideration.

In agreement with others, the author believes that in these cases a subastragaloid arthrodesis is indicated. Many of the patients are thereby spared suffering for years, even though in some cases the symptoms do not disappear entirely. The author also believes that immediately after the admission of the patient the recent fracture should be reduced in the usual way, namely by restoration of the anatomical relationships as much as possible even though it may not be complete. In order that the later intervention need not be so extensive, and include the chiselling off of exostoses, Hermann first accomplishes a reduction and about four and one-half months later he performs subastragaloid arthrodesis in the cases in which the symptoms persist. This period of time is advantageous because there is opportunity of allowing the patient to step on his foot and of observing any malpositions, which can then be corrected in the course of the operative procedure.

Some surgeons identify arthrodesis not only of the posterior talocalcaneal joint, but also of the entire Chopart joint. The lateral incision alongside the peroneal tendons is used, so as to obtain a good general view of the joint. The goal of the treatment for these fractures may be set as complete anatomical and functional restoration but unfortunately one finds that a completely satisfactory result is not obtained and, instead, the subjective symptoms of the patients must be the decisive factor.

LOUIS NEUMANN, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Meyer O Latent Phlebitis as the Cause of Gangrene (Latente Phlebitis als Ursache von Gangraen) *Muenchen med Wchschr*, 1940, 1: 581

Nearly one half of all amputations of the thigh can be avoided if early attention is paid to latent phlebitis and if a suitable treatment is instituted. Each inflammatory process is accompanied by an edema of the inner layer of the walls of the veins, which leads to a diminution in the size of the lumen. This in turn may produce venous congestion, which should be looked for in each case of gangrene of the toes. A search for a pulsation of the arteries of the feet is not sufficient, especially in the presence of an edema. If an arterial pulsation cannot be detected an attempt should be made to record a pulse curve with a special apparatus. The author uses the Cam bridge pad which consists of an extremely thin semi globular rubber bag filled with glycerine. A latent phlebitis may be detected by means of pressure points described by the author previously (*Muenchen med Wchschr*, 1927, p 721, 1933, p 455).

The author recommends the therapeutic measures suggested by Fischer. They produce a standstill of the gangrene and in early cases even a complete recovery. The author was able to avoid high amputation in each case and found it sufficient to remove only the gangrenous portion immediately above the demarcation line. Attention should be paid to sources of a focal infection, such as the teeth or tonsils, because a latent phlebitis of the jugular veins may originate there. The subject is of great importance for war surgery.

(D Blos) JOSEPH K. NARAT, M D

Bauer, G A Venographic Study of Thrombo-Embolie Problems *Acta chirurg Scand*, 1940 84 Supp 61

By a new and promising method, the deep veins of the lower leg are made visible on the x ray film and the thrombo embolic process can be studied in its earliest stages. The objective of the author in the work reported herewith is to discuss what may be gained by this type of venography and to submit his conclusions from a venographic study of available material. Briefly his technique is as follows.

The patient is placed on his back on the operating table with a cassette under the affected leg, its lower edge about 10 cm above the malleolar level. Under local anesthesia an incision about 2 cm long is made behind the external malleolus. The vertical vein is isolated and lifted by silk threads. After injections of physiological saline solution to insure free passage, a syringe containing 20 cc of 35 per cent perabrodil is fitted to the needle. By accurate timing the injection is made steadily through an interval of 60 seconds. The x ray exposure is made immediately

for venography of the pelvic veins, the large saphenous vein is used.

From the study reported extensively, the author concludes that thrombo embolic disease almost invariably starts in the great deep veins of the lower leg. Its earliest stages can usually be unmasked there with the aid of venography. Therefore, a venographical examination should be made immediately when even the slightest clinical signs of an incipient thrombosis manifest themselves in a patient.

If this examination results in no opaque filling of the veins within the lower leg, whereas the femoral vein is well filled, a treatment consisting of elevation of the foot of the patient's bed in conjunction with the routine administration of heparin ought to be instituted immediately. If no shadow of the femoral vein shows up on the venogram, there are two possibilities. One is that there is already tenderness over this vein and swelling of the thigh, i.e., signs of a firmly adherent thrombus in the femoral veins. Heparin treatment then confers no local benefit, but should none the less be used to prevent further propagation of the thrombus within the pelvic veins or another thrombosis arising in the lower leg.

The other possibility is that the absence of filling in the femoral vein does not coincide with any tenderness over this vein. The greatest watchfulness is then imperative. The risk of pulmonary embolism is great. Treatment should consist of raising the foot of the patient's bed as well as of energetic heparin administration. In addition, the medical attendant must be ready to intervene surgically by way of vein ligation.

The least deterioration of the condition in the shape of one or more pulmonary infarcts, rising temperature and pulse, or an especially active process in the lower leg (intense tenderness, pains), is an indication calling for operation. The uppermost part of the large saphenous vein is exposed by means of a short vertical incision. Through this venography is made. If the common femoral vein shows up well filled with the opaque medium, the incision can be extended, and ligation with resection can, as a rule, be done at the most ideal spot, just below the origin of the profunda. In these cases the postoperative symptoms are slight.

Should the thrombosis extend upward past the origin of the deep femoral vein, a ligature can also be applied to the common femoral vein, if the latter is found to be free of thrombosis at any point. In these cases the postoperative symptoms are somewhat more pronounced.

If venography shows that the common femoral vein also is totally obliterated, there is no means of judging the proximal extension of the thrombosis, and recourse to ligation should be made only in rare and exceptional cases. In chronic thrombosis as

well, venography often gives valuable information that can be turned to good therapeutic account.

HILBERT F. TUCKSTON, M.D.

BLOOD TRANSFUSION

Bushby, S. R. M., Kekwick, A., Marriott, H. L., and Whithy, L. E. H.: The Survival of Stored Red Cells After Transfusion. *Lancet*, 1940, 39, 4-4.

When transfusion is given for anemia, the important element in the blood is the red cell. Also with severe hemorrhage, transfusion is often designed theoretically to restore red-cell elements so that oxygen-carrying power may be increased. However with acute hemorrhage and more especially with a wound shock there are other more important advantages to be gained from transfusion, viz. (1) restoration of blood volume (2) restoration of blood protein and (3) restoration of a reasonable blood pressure. The authors are concerned with that which is designed to restore the red-cell elements.

They noted that every transfusion of blood to which no glucose was being added and which had been stored for more than two days caused a detectable increase in plasma bilirubin, even though no clinical jaundice was present. Experiments which they conducted suggested that the rise in plasma bilirubin were due to hemolysis of transfused cells *in vivo*, and that the circulating pigment was derived from fragile cells contained in the transfused specimen.

The only true test of whether transfused red cells endure in the recipient is to follow the fate of the cells by repeated examinations. For this simple blood count is insufficient because it does not show whether rises or falls in total count are due to autogenous cells or to the transfused blood. However when Group O blood is given to Group "V" patient and vice versa, the fate of the transfused blood can be observed by making counts of the cells not agglutinated by an appropriate serum.

The following have been investigated for their influence on the fragility of stored blood: (1) carbohydrates, (2) citrate and other anticoagulants, (3) dilution and plasma factors, (4) saline, (5) temperature, (6) acidification, (7) oxygenation, (8) enzymes and leucocytic action, and (9) sundry other factors. Of the single factors, glucose is outstandingly the best. The enhancement given by glucose and dilution, or by glucose, dilution, and acidification is recognizable as such, but the degree is not sufficient to justify utilization for the practical storage of blood.

Brewer *et al.* have reported that stored blood from ten to fourteen days old which contains glucose is as efficient as fresh blood for the treatment of acute hemorrhage. The authors confirm this statement and show that even older blood survives a reasonable time in the recipient, and certainly long enough to keep a wounded man alive until he arrives at the place where he can receive complete surgical care.

Such was the experience in recent campaigns, during which some 300 transfusions of blood from ten to thirty days old were given. Further this old blood appeared to cause a negligible number of reactions, even though it had been subjected to the batterings incidental to transport. This good preservation may have been due partly to the Army system of "topping" the bottle so that it is completely filled, all air excluded, and no slopping possible. De Gowing *et al.* found that hemolysis was delayed when blood was stored in sealed air-displaced flasks, as compared with blood exposed to air.

It is clear from the bilirubinemia which is associated with the transfusion of stored blood that the older the blood the more rapidly are its fragile corpuscles destroyed. The iron pigment thus set free is phagocytized by the reticulo-endothelial system and assists in blood regeneration during convalescence from hemorrhage. Provided that the blood is not so old as to liberate suddenly a dangerous quantity of pigment, the transfusion of even quite old blood to the exsanguinated has much to commend it.

HILBERT F. TUCKSTON, M.D.

Mabala, M., and Paterson, J. H.: The Survival of Stored Blood After Transfusion. *Lancet* 1940, 39, 4-7.

There are several ways in which the fate of stored blood may be investigated: (1) by clinical observation (2) by the increase in the recipient hemoglobin brought about by transfusion, and the permanence of this rise (3) by the direct demonstration of the persistence of the donor's cells in the circulation of the recipient.

The degree of persistence of the donor's cells after transfusion affords the most direct and positive evidence of the value of transfusion of stored blood. This third method was adopted in this investigation, which deals with the survival of stored blood-cells measured with iso-agglutinins and with changes in the chemistry of stored blood cells in the recipient's blood after transfusion. Transfusions have been carried out with blood and citrate solution mixed in the proportion of 1 to 1. The citrate solution contained sodium citrate (0.05 per cent) sodium chloride (0.85 per cent) and glucose (3 per cent).

Abbey devised a method of measuring the survival of erythrocytes after transfusion of fresh blood by the use of Group O donors for Group A recipients. Blood was withdrawn from the recipient before transfusion and at suitable intervals afterward and mixed with Group B serum. The recipient's A cells were agglutinated while the donor's O cells remained free and were counted. It was assumed that the number of free cells present at any given interval after transfusion represented the number of transfused cells surviving at that time.

It has been shown that stored erythrocytes often contain more than four times as much sodium as do fresh cells. Since it is known that stored cells survive for many days after transfusion, it was thought of interest to measure what changes took place in

the chemistry of the donor's cells after they had reached the recipient's circulation

The sodium content of the erythrocytes of stored blood is several times greater than that of the recipient's cells before transfusion. Immediately after transfusion there is a rapid rise in the level of the sodium of cells in the recipient's circulation. However, in almost every instance the sodium level returned within twenty-four hours to that found in the recipient's cells before transfusion. This can only mean that the transfused cells have been destroyed, or that they have been chemically "re-conditioned" with the result that the great excess of sodium is removed and replaced by its equivalent of potassium. The disappearance of sodium is not accompanied by a corresponding fall in the count of donor's cells, and it is therefore necessary to conclude that the rapid return of sodium to normal is due to a process whereby the excess of sodium is removed and replaced by potassium.

Since this ionic exchange between the donor's transfused cells and the recipient's plasma must take place against a steep concentration gradient, it cannot be due to any simple physical process. Possibly, the spleen, which is known to produce changes in the surface of erythrocytes, may play a part.

In conclusion, the authors note that stored blood survives for considerable periods after transfusion. Red cells stored for less than a week show about 70 per cent of survival fourteen days after transfusion. If the storage is between seven and fourteen days, more than half the transfused red cells are still present in the recipient's circulation fourteen days after transfusion. During storage normal cells lose potassium and take up a great excess of sodium. Within twenty-four hours of transfusion the chemistry of stored cells is restored to normal.

HERBERT F. THURSTON, M.D.

Buttle, G. A. H., Kekwick, A., and Schweitzer, A. Blood Substitutes in the Treatment of Acute Hemorrhage, An Experimental Evaluation, Standard Conditions, Control Experiments, Plasma and Serum, Clinical Application. *Lancet*, 1940, 239 507.

In order to meet the need for immediate treatment of many widely scattered injuries occurring in war some substitute for the transfusion of whole blood must be found.

The authors have carefully studied the results obtained in cats bled in a standard fashion and given whole blood, saline solution, glucose, gum acacia-saline solution, 25 per cent hemoglobin-Ringer, red blood cell saline suspension, blood plasma, blood serum, and various types of dried serum. All the controls died. All those given whole blood survived and maintained stable blood-pressure levels. Those given either saline solution or glucose died after a somewhat longer survival period than the controls. The mortality was about 50 per cent after gum-saline solution or a cell-saline suspension. Those given 25 per cent hemoglobin-Ringer solution sur-

vived but had a respiratory disturbance and an unstable blood pressure. All those given either filtered or unfiltered blood plasma survived and showed no disturbance. Reactions occurred in 5 of 7 serum transfusions, 3 of them being severe. The same type of disturbance occurred after the administration of dried serum. Plasma-saline solution gave a temporary rise in the blood pressure but this was not maintained.

Plasma containing the smallest amount of crystalloid diluent possible is concluded to be the only available fluid which will approximate the results of whole-blood transfusions. Serum is next in order but was not recommended because of the reactions which were experienced. The scant literature on the subject indicated that blood plasma may be safely stored and filtered.

The authors state that the Army Blood Transfusion Service has had encouraging clinical results with filtered blood serum.

THOMAS C. DOUGLASS, M.D.

Aylward, F. X., Mainwaring, B. R. S., and Wilkinson, J. F. The Concentration and Drying of Plasma. *Brit. M. J.*, 1940, 2 583.

The authors enumerate the available methods of concentration of blood plasma: distillation from frozen serum, by means of a high vacuum and a desiccant such as phosphorous pentoxide, and spray distillation in vacuum. They describe in detail the last mentioned method but state that the apparatus is expensive and the output small. Another method investigated by them was the evaporation of liquid after dialysis through a cellophane membrane. They stress the importance of early separation of the serum before hemolysis has occurred. The concentrated plasma produced by these methods renders prolonged storage with little space possible and has all the advantages of the dry serum.

THOMAS C. DOUGLASS, M.D.

Brown, H. A., and Mollison, P. L. Note on the Transfusion of Reconstituted Dried Human Serum. *Brit. M. J.*, 1940, 2 821.

The usefulness of plasma and serum in the treatment of shock and even acute hemorrhage is now recognized, but there is some uncertainty as to whether serum has any disadvantages as compared with plasma. The authors review the opinions expressed by many writers in the recent literature. They have observed that wide experience from all serum centers indicates that properly prepared serum is safe. In the observations reported here with the object is to point out that the dried serum emanating from the Medical Research Council drying unit at Cambridge is not only safe but efficacious.

Ninety-one transfusions of this serum have been given. Most of the serum used was from donors of Group AB. Some serum of Group A and some pooled serum were also given. In most cases the serum was administered in four-times-normal concentration by reconstituting the dried powder to

only a quarter of the volume of the original serum. One of the disadvantages of using these high concentrations is the rather long time taken for complete solution. This can materially be reduced by vigorous shaking of the dried serum before adding the distilled water so that all lumps are well broken up. The water for solution should be warmed to 40° C. before addition.

It was considered that unequivocal evidence of clinical improvement was found in 23 of 44 transfusions. It is clear that the results are better when larger doses are given, not less than the equivalent of 400 c.cm. of normal serum should be administered initially, while larger quantities will almost certainly be required in severe cases. After the 9th transfusion 7 febrile reactions were noted. There were 6 cases of vomiting, of urticaria, and 3 of lumbar pain. During 3 of the transfusions of four times-normal serum, the patient complained of severe pain, cramp-like in nature, referred to the lumbar region.

The pain in some instances radiated to the sacral region. The symptoms were of short duration and were not followed by further symptoms or signs. Although there was no reason to expect a hemolytic reaction, nevertheless direct matching tests between the serum given and the corporcles of the recipient were performed in these cases of lumbar pain, and no agglutination could be observed. Moreover there was no hemoglobinuria in any of these cases.

When the results reported herewith are combined with the results from other sources, obtained personally, it is found that a record of 20 transfusions of dried serum is available among these there are 34 reactions, practically all of them mild. Reactions occurred in 8 of 30 plasma transfusions. This reaction rate after a small series of plasma transfusions has been noted for comparison. Little difference between the two series is evident.

HARVEY F. THURSTON, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Hayes, S N Imperfect Sterilization of Dressings
as a Probable Cause of Postoperative Tetanus
Brit M J, 1940, 2 825

In the past, imperfectly sterilized catgut has often been blamed for cases of postoperative tetanus. In spite of the present carefully controlled preparation of catgut, cases of postoperative tetanus continue to be reported. As a consequence, the author suspects that improper sterilization of surgical dressings may be a factor in the production of these cases, and he presents experimental evidence to show that tetanus spores persist in dressings when care is not used in the autoclaving process.

Cotton wool is a material prone to harbor tetanus spores and because of its tendency to expand on heating, it resists the penetration of steam. It is essential (1) to pack drums loosely with this material, (2) to use perforated drums, and (3) to expel all air from the autoclave by means of an adequate air vent at the bottom of the sterilizer. If these three conditions are carried out, the experimental work of the author shows that spores are invariably killed.

DeTakats, G Postoperative Thrombosis and Embolism Illinois M J, 1941 79 25

There are 3 important factors which predispose individuals to postoperative thrombosis. *Hemoconcentration*. Whenever blood loses some of its fluid content the clotting tendency is increased. This occurs not only in dehydration due to vomiting inability to take liquids by mouth, or diarrhea but is typical of the delayed secondary shock following operations or burns. It is also present in conditions in which the blood protein is diminished because the fluid then passes out into the tissues as in nephrosis peritonitis or conditions with a large fibrinous exudate in the pleural cavity. This hemoconcentration is most easily detected by red cell count and hemoglobin determination. When it is found its correction must be attempted by the restoration of fluid balance and of blood proteins.

Slowing of venous return. The drainage of venous blood from the lower extremities and pelvis is markedly retarded after operations. The factors responsible for this are (1) fall in the arterial pressure (2) decreased diaphragmatic excursions, which greatly influence the emptying of the venous cavity (3) increased intra-abdominal pressure due to distention and tight dressings and (4) lower position which creates a venous pool in the pelvis. When these four factors are overcome much will have been done to stimulate the venous return. The most potent stimulus for venous backflow is active muscular movement and the postoperative

patient should be encouraged to do this after the third day. Prolonged immobilization always carries a higher risk of thrombosis and embolism.

The meteorological factor. It has been found that during the spring and fall more emboli occur, the summer months are comparatively exempt. Marked deviations from the mean temperature during any particular period also seem to have an influence on the mobilization of blood clots. A similar effect of the weather on the thrombosis preceding the embolism is unmistakable.

The early, premonitory symptoms of thrombosis must not be overlooked—a small rise in the evening temperature, a persistently elevated pulse rate with out any evident cause, an elevation of the skin temperature of the sole of the foot on the affected side, pain on pressure on the sole of the foot, on the calf muscles in the popliteal space on dorsiflexion of the ankle or in the groin a slight edema of the groin or in the suprapubic region, frequent urination or mucous stools, and pain in the small of the back. The last three symptoms are suggestive of pelvic thrombosis while the location of the pressure pain often denotes the site of the original thrombus.

The objectives of treatment are to free the limb of the edema and to protect the patient as far as possible from propagating thrombosis and embolism. The treatment is discussed in detail. Many small pulmonary emboli go unnoticed. The three leading symptoms of pulmonary embolism are dyspnea cyanosis, and chest pain. The associated fall in blood pressure is evidenced by the weakness and rapidity of the pulse. Abdominal symptoms often suggesting gall bladder colic occur. The emergency and delayed treatment of pulmonary embolism is discussed.

SAMUEL KAHN, M D

Leun W The Prevention and Treatment of Distal Thromboses with Elastic Adhesive Bandages (Verhuetung und Behandlung der Fernthrombosen mit elastischen Klebelmpressionsverbänden) Muenchen med Wchschr, 1939 2 1271

The author has had nine years of experience with the H. Fischer bandage, having applied 900 bandages on 600 patients. The results are very favorable in the treatment as well as in the prevention of thrombophlebitis. Sonntag and Mueller have treated 2000 cases of acute thrombophlebitis and consider the older treatment of bed rest, elevation, and moist applications to be erroneous. H. Fischer observed 200 cases of phlebitis of the leg and thigh without an embolism. F. Fischer observed no fatal emboli in 2000 cases, but had from 12 to 15 small infarcts.

In the Pitter clinic this bandage has been applied 400 times in 350 patients with thrombophlebitis of the superficial or deep veins with or without

fever. Only in the presence of a simultaneous pharyngeal thrombosis was conservative treatment used, without the adhesive bandage. There were 5 cases of fatal and 2 of mild embolism. In the former however the thromboses were in the pelvic and not in the peripheral veins. In the 3 milder cases, the cause was probably the same, but even if the embolisms were ascribed to distant thromboses, the results were still good in view of the usual statistics of embolism in from 17 to 57 per cent of the cases (Martini and Opitz, Podleschka, Ranzi, and Huber).

Hitherto, there has been no method by which the progression of thromboses or of embolism could be prevented. The further advantages of the bandage are: (1) the patient can get up immediately after the application of the bandage, and (2) pain and fever disappear at once.

In addition, the bandage has been applied prophylactically in the clinic, 500 times in 250 patients. There were apparently only 3 failures. All other prophylactic measures are less effective. In the failures, the bandages had become loose and were not reapplied. The technique of bandaging is described in detail, and should be read in the original. Elastoplastic bandages for the foot are 10 cm. wide, for the leg 8 cm. and for the knee and thigh 5 cm. The bandage is cut after every turn. Half of the upper turn always covers half of the one beneath. Only at the knee is the overlap but 1 cm. in order to prevent disturbances in motion. Cotton padding is used under the foot and in the popliteal space. Semilunar felt pads are used under the malleoli. It is important in prophylaxis as well as in therapy that the bandage be applied under constant tension. In acute thrombophlebitis above the femoral vein, a pad is applied over the femoral vein in the form of a cotton wad 4 cm. in diameter and 6 cm. long, and held in place by turns from above downward. In early thrombophlebitis, the adhesive bandage is left on for three or four weeks, provided it does not become loose. This is followed by the wearing of elastic bandages and rubber stockings.

(FRANCE) LEO M. ZUCKERMAN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Page, C. M. Surgical Experiences with the B. E. F.
Brit. J. J. 940 73

The rapid movements and quick change in events in France and Flanders during May and June of last year imposed strain on the medical organization comparable to that which the combatant section and other services were submitted. At the outset of the war the medical units and personnel were essentially the same as those which are operative at the end of the last war. In addition there were provisions for more mobile surgical teams for service in the casualty clearing area and the establishment of the Blood Transfusion Service.

The following outline represents an attempt to piece together the aims and achievements in han-

dling the wounded man, and defines those aspects of the subject which appear to call for further trial and study.

Wound prophylaxis. Every wounded man received 3,000 units of anti-tetanus serum. Though the final figures are not yet available the author knows of but 4 cases of tetanus in France. Anti-gas-gangrene serum (polyvalent) was available in quantities but was systematically employed as a prophylactic. Sulfanilamide was also used in large quantities. It was given by mouth or as a wound pack. The dosage when given by mouth was generally 5 gm. followed by 1 gm. at four-hour intervals until a total of from 15 to 20 gm. was reached. In the wound pack from 5 to 20 gm. were placed in the wound and kept in place by suture or protective dressing. The general impression was that both streptococcal and anaerobic infection of wounds was definitely reduced by this action.

Surgical treatment. It is generally accepted that from 20 to 40 per cent of the reclining patients, and 5 per cent of those walking should be operated upon within twelve hours after being hit in order to achieve the best results. The importance of the treatment of primary and secondary wound shock before operation was fully recognized, and resuscitation teams, generally organized by an officer of the Blood Transfusion Service, are established both in casualty clearing stations and in base hospitals. Warmth, rest, and morphine had their place, but undoubtedly the provision and transfusion of stored blood was of key value. The general principle of wound excision (*épluchage* of French surgeons) determined the scope of the primary operation apart from the repair of any special vessels. The procedure was carried out whenever possible if the patient as received within twelve to twenty-four hours after the injury. The excision should not involve the removal of much skin, but free incision is necessary to carry out the process effectively. Excision of devitalized fascia and muscle is of chief importance. In regard to primary sutures after such operations the general experience in France was against the practice.

The complications of fracture or joint injury are also indications for surgery. On the other hand, through-and-through wounds due to rifle or machine-gun bullets are recognized as relatively benign from the point of view of infection. It is noted in France that this is the case, and such wounds are seldom excised if uncomplicated by serious hemorrhage or the perforation of hollow organ.

In the event of man not coming under surgical care for two or three days after being wounded, for small wound excision is out of place. The treatment employed was to lay the wound freely open, remove the missile if possible and excise necrotic muscle. Amputation was resorted to only in the more serious cases of gas infection.

The after treatment both of wounds excised early and of wounds laid open on account of infection was to pack them with gauze sometimes soaked in vaze-

line When sulfanilamide was put into the wound the gauze pack was not employed A course of sulfanilamide was also sometimes given by mouth to both groups of cases The general practice was to avoid the redressing of wounds for four or five days unless the clinical signs suggested some progressive infection or the presence of secondary hemorrhage or gangrene The closed plaster cast was not systematically used for wounds uncomplicated by fracture

Fractures The transportation of persons with fractures was carried out under accepted lines, the Thomas splint proved of great value both in transportation and in definitive treatment of fractures of the femur Fractures of the tibia and fibula were generally placed in plaster casts, and in some of these cases transfexion pins were placed in the casts Very few infections resulted from this practice Fractures of the upper third of the humerus were bound to the side against an axillary pad Fractures in the lower third were immobilized in plaster casts or in plaster slats The Orr method of treatment was used with satisfactory results in fractures of both extremities

Little opportunity occurred in France in May and June for the practice of the more deliberate type of surgery applied to the abdominal, head, and chest wounds Certainly no advance was made on the experiences of the last war JOHN W EPTON, M D

Cobet, R Evaluation and Treatment of Lung Injuries Caused by Firearms (*Beurteilung und Behandlung der Lungenschuesse*) *Therap d Gegenw*, 1940, 81 241

This work presents a review of the evaluation and treatment of pulmonary injuries due to firearms from the point of view of internal medicine, which is also interesting for the surgeon

First of all, it is important to establish what organs have been damaged by the projectile Peripheral nerves (brachial plexus) and the spinal cord, as well as the diaphragm and abdominal organs, may have been injured in addition to the lung Death usually occurs on the battlefield in wounds of the heart, the large vessels, and the esophagus—in the latter cases, because nearly always some large vessel has been wounded at the same time The total mortality of chest injuries by firearms amounts to about 40 per cent The connecting line between the points of entry and exit of the projectile under consideration of the posture of the body at the moment of the injury, gives a fair indication of the possibly damaged organs Spent projectiles may inflict wounds with only a point of entry, occasionally with dropping of the projectile into the pleural cavity Grazing of the lungs and secondary injuries by sharp fragments of bone may be caused by tangential shots

Hemoptysis, hemothorax, pneumothorax, and emphysema of the skin are the main clinical signs of pulmonary injury The freshly coughed up blood is bright red and foamy and becomes darker to a brownish cast in a few days, it is dark from the beginning in pulmonary contusion with hemorrhagic

infarction Late hemorrhage is principally caused by jagged grenade fragments and infectious erosion of vascular aneurysms Hemothorax occurs nearly always in penetrating injury to the chest and remains absent only in case of pre-existing pleural adhesions In general, the hemorrhages from the intercostal arteries or the internal mammary artery are more dangerous, while those of pulmonary wounds, because of the elasticity of the lung tissue, endanger life in exceptional cases only, for instance, when the tract of the projectile is kept expanded by pleural adhesions The blood collecting in the pleural sac is diluted by an admixture of serous exudate and during the third week contains only about 1,000,000 red cells and from 1,000 to 10,000 white cells per c mm, with a specific weight of from 1.023 to 1.026, in the case of sterile hemothorax From the second to the third week, the number of the eosinophils increases occasionally up to 80 per cent of the total leucocytes, and shortly before resorption the lymphocytes preponderate Numerous endothelial cells can also be demonstrated The resorption of a hemothorax requires weeks Usually, a rather extensive pleural scar remains Pneumothorax is also generally observed in a pulmonary injury by a projectile Small collections of air are rapidly absorbed The valvular and the infectious tension pneumothorax may cause threatening symptoms Open pneumothorax, whether primary or secondary, is dangerous on account of the possibility of mediastinal flutter and pleural infection While interstitial emphysema of the skin in pulmonary injury is harmless, that of the mediastinum may cause severe symptoms and require surgical intervention

Associated injuries of the abdominal organs or of the diaphragm are not rare in chest wounds by firearms However, tension of the abdominal wall may occur as a result of irritation of the intercostal nerves in purely thoracic injury without participation of the abdominal cavity Prolapse of the abdominal organs into the left thoracic cavity because of injury to the diaphragm may give rise to symptoms which simulate a tension pneumothorax Damage to the kidney must be excluded by urine examination for blood Firearm injuries to the chest or lungs, which are not infected, usually heal rapidly, the presence of fever is to be interpreted as a resorption symptom or must be attributed to slight pneumonia in the vicinity of the tract of the projectile through the lung

The subsequent fate of the patient with a lung injury is decided by an infection of the pleural sac Benign, serous pleurisy dilutes the usually present blood collection so that its specific weight is lower (about 1.019) than in simple hemothorax The red cells are preserved and the lymphocytes preponderate in the moderate amount of white cells found The punctate is mostly sterile and microscopic examination shows only individual phagocytized bacteria in the sediment The course is benign and can be accelerated by puncture Accompanying serous exudations, for instance, in subphrenic or thoracic

wall spaces are also mostly benign, but their course depends wholly on the primary focus. Highly virulent or massive pleural infections rapidly cause severe disease pictures. The red cells are dissolved even in the case of bacteria which bacteriologically are not designated as hemolytic. However the punctate remains opaque on account of the preservation of the red-cell shadows, but a yellow purulent precipitate appears in the place of the red cells when the punctate is centrifugated or permitted to stand. These signs allow recognition of a virulent pleural infection in hemothorax even without bacteriological examination.

Microscopic study reveals mostly eosinophil polymorphonuclear leucocytes with faded and often destroyed nuclear picture and, in addition the bacteria in varying but large numbers. This form frequently leads to death in from ten to four teen days if it is impossible to overcome the infection and to reach the stage of early empyema. A hemothorax infected with putrefactive bacteria is rapidly decomposed with the development of gas, which may cause a secondary or infectious tension pneumothorax. The punctate is laky and evil smelling and contains masses of bacteria of various kinds. However gas-gangrene bacilli are only seldom found. Tension pneumothorax is generally prominent among the clinical phenomena. Usually the course of the disease is rapidly fatal.

Infections of average severity recognizable by their less stormy clinical picture, show because of their slower hemolysis, wine-red to dark brown effusion with copious, dirty yellowish brownish, centrifugated precipitate of leucocytes, red-cell forms, and rather numerous bacteria. However primary pleural infection may also develop independently from a hemothorax. It leads mostly to encapsulated empyema. A secondary infection from supuration of the thoracic wall pulmonary abscess subphrenic abscess, or pneumonic infiltrate may penetrate into the thoracic cavity by sudden eruption of pus or by gradual migration of the bacteria. In the first case, the symptoms are stormy and threatening. The total empyema which then often occurs, opposes reexpansion of the lung in protracted supuration, because of marked deposition of fibrin on the pulmonary surface and to the latter induration. In addition to the numerous and not always equivocal clinical signs, the result of the test puncture is of decisive significance for the recognition of empyema. The needle is introduced as far as possible to the upper limit of dullness to site where no respiratory murmur can be heard.

The treatment of pulmonary injury by firearms should be mostly conservative and depends upon the requirements of the symptomatic picture. Transportation, even by airplane is badly tolerated by the newly wounded and should not be attempted any earlier than fourteen days after the last hemoptysis. The care of the wound consists of cleansing and sterile dressing when open pneumothorax, a tension pneumothorax, or hemorrhage does not

impose surgical intervention. A piercing projectile is removed only when it can be reached easily and even then mostly secondarily. A non-infected hemothorax is punctured only when it causes digestive disturbances otherwise it is treated conservatively. On the other hand, virulent infection of a hemothorax is actively attacked repeated and adequate punctures are performed in an attempt to overcome the infection to the point where still necessary rib resection can be deferred beyond the third rib. Empyema, pulmonary abscess, and gangrene must be treated surgically.

(MUSKE) RICHARD KENT, M.D.

Andrews, C. H. The Control of Air Borne Infection in Air Raid Shelters and Elsewhere; Bacteriological Technique Organisms in Coarse Droplets, Organisms in Droplet Nuclei, Bactericidal Agents, How and When to Spray or Sanitize on Dust. *Lancet* 1940, 30, 770.

Air-borne infection may be conveyed (1) in large droplet projectiles sprayed short distances from the mouth or nose (2) in droplet nuclei which may float in the air for long periods and (3) on dust.

Adequate spacing and ventilation are the most important counter-measures whatever the root of spread. Small and large-scale investigations have been made into the efficacy of other measures which may be applied when these are impracticable.

Spread by large droplets may be controlled (1) by isolation of infected persons (2) by screens between the heads of neighboring sleepers and (3) by masks, of which one made of transparent cellulose acetate is comfortable, effective, and cheap, though unsuitable for wearing at night. Masks should be worn during the daytime by working people and occupants of shelters to have colds, and by all occupants of public places during influenza epidemics. In shelters those with coughs should wear gauze masks at night.

Ultraviolet light is highly effective against organisms in droplet nuclei but much less so against organisms on dust. Where forced ventilation is in use the incoming air can be rendered almost sterile by passing it through a cloth filter and between ultraviolet lamps. The cost of installation renders the general use of ultraviolet light impracticable in shelters at the moment.

Of several bactericidal agents effective against suspended organisms dust of soda hypochlorite is cheap, harmless in low concentration, almost odorless, and powerful deodorant. Sodium hypochlorite corrodes metal but suitable non-metallic sprayers worked either electrically or by foot-pump, are available. Small shelters should be sprayed before the occupants assemble every half hour before they settle down for the night, and again in the morning. In an epidemic spraying may have to be repeated every half hour during the night. It may be necessary to spray large shelters more or less continuously.

Dust on floors can be prevented from rising by treating the surface once a month with spindle oil.

(crude liquid paraffin) Blankets can be prevented from dispersing their dust by soaking them in a 30 per cent solution of liquid paraffin in white spirit, and this will not make them feel oily

The authors state that none of the methods for the control of respiratory disease which they have discussed is of proved efficacy in the field, though all of them have given encouraging results in the laboratory. However, there is justification in urging the use of methods of such unproved value because the means of controlling respiratory disease in the past have certainly been inadequate. The unprecedented conditions of life in a large part of Britain during this winter may be expected to swing the odds in the struggle between man and his respiratory pathogens still more heavily in favor of the bacterial forces. An ordered plan of defense is more necessary than ever before. The weapons of defense include the improvement of ventilation, masks, ultraviolet light, anti-septic mists, and the paraffining of floors and blankets. Which of these is best employed in any set of conditions is a tactical problem for the medical man in charge. In many instances it will be advisable and even necessary to combat simultaneously the three dangers of droplets, droplet nuclei, and dust.

SAMUEL H. KLEIN, M.D.

Simon, R., and Patey, G. A. War Tetanus, With Reference to 14 Cases Observed at the Centre Sanitaire Français of Besançon. The Action of Anesthetic Injections of the Sympathetics (Le tétanos de guerre. [A propos de 14 cas observés au Centre Sanitaire Français de Besançon.] Action des infiltrations anesthésiques du sympathique) *Presse méd.*, Par., 1940, 48, 935

The authors observed 15 cases of tetanus in a total of almost 1,900 wounded. Because of depletion these cases showed certain interesting imbalances of the sympathetic nervous system. Of their 15 cases only 1 had been regularly vaccinated with antoxin, and this patient had an essentially benign and localized form of tetanus. Antitoxin had not been given or was given late in 12 of the 14 cases. It had been correct in 2 cases, and these 2 were cured after a short course of serotherapy.

The authors distinguish a hyperacute and an acute form of the disease. Of the former they had 2 cases, in both of which the patient died in thirty-six hours. Deep anesthesia was the only means of interrupting the state of constant tetanic spasm. Both patients had wounds in the scapular region and the incubation periods were less than a week. Four examples of the acute form are described. They were cases with incubation periods of from six to nine days, all of the patients had had amputations. They responded at first to treatment with serum and sedatives, but in a few days developed excruciating pain in the amputation stumps and again there were severe spasms which did not respond to the previous therapy. One of the patients died, but the 3 others responded to novocaine injection of the sympathetic ganglia supplying the limb in question. The dose in

1 case was 20 c.cm. of 10 per cent novocaine injected into the lumbar ganglia.

War tetanus, then, is different from civilian tetanus, in which the tetanus toxin plays the greatest part, in that major rôles are also played by the depleted state of the patient and by the painful stimulus of the extensive wound. Therapeutic procedures suggested by these facts are (1) the treatment of the tetanus intoxication, and (2) the avoidance or attenuation of the irritative action of the wound or amputation stump.

The treatment of the tetanus intoxication was carried out along accepted lines as follows.

Serotherapy was given to the extent of from 80,000 to 120,000 units a day for the first few days and then the amount was diminished. In the serious forms almost 1,000,000 units have been injected by the subcutaneous or intramuscular route. The intraspinal route is not used. Serum sickness occurred in only 2 of the 14 cases. The sedatives and anesthetics used were chloroform, chloral, and avertin. Sulfanilamide was used in large doses in 1 case without obvious beneficial effect. General anesthesia with chloroform was used for half-hour periods as often as three times a day. The excessive use of hypnotic drugs is usually ineffective and may cause severe neurological symptoms such as decerebration. The treatment of the peripheral irritation factor is best carried out, as described, by novocaine block of the sympathetic supply of the area. Infiltration of the regional nerves does not have the same effect.

RICHARD WARRFY, M.D.

ANESTHESIA

Brown, W. E., and Lucas, G. H. W. Further Studies with Ethyl Normal Propyl Ether. *Canadian M. Ass. J.*, 1940, 43, 526

From work reported one year ago by Brown on the anesthetic properties of ethyl normal propyl ether it was believed that it was a safe anesthetic and might be used on the human subject without ill effect.

Proceeding cautiously in the first of a series of human anesthetics, ethyl normal propyl ether was used to reinforce nitrous-oxide-oxygen mixtures in approximately 50 anesthetics for various operative procedures, the nature of which did not require any particular degree of relaxation, the patients being carried in the light phases of the third degree of anesthesia. The series included such procedures as dilatation and curettage, amputation of the hand, the treatment of hydrocele, litholapaxy, suprapubic prostatectomy, the treatment of a lump in the breast, and similar types of operations.

A follow up made of all the cases showed rapid awakening, comparable to nitrous-oxide-oxygen alone. Slight vomiting occurred with awakening in 7 per cent of the cases, during the following twelve hours, 11 per cent had some vomiting, after this time 2 per cent still had vomiting. An appreciable fall in the blood pressure was noted in 4 per cent of the cases.

A comparative analysis of the anesthetic effects of diethyl ether and ethyl normal propyl ether was made with the closed system method of Kruse. Observations on a limited number of cats were made. From these experiments the following conclusions may be drawn:

Ethyl normal propyl ether is from one and a half times to twice as potent an anesthetic as ethyl ether. Respiration was definitely depressed by the ethyl normal propyl ether in some 4 to 5 per cent concentrations, and by ethyl ether in some 6 to 8 per cent concentrations. Respiration was more depressed in deep surgical anesthesia with ethyl normal propyl ether than with ethyl ether. Light surgical anesthesia with from 2.5 to 3 per cent of propyl ethyl and from 3.5 to 5 per cent ethyl ether was obtained under comparable conditions. The blood pressure did not fall seriously even when the respiration was dangerously slow and shallow and fell only to about 60 mm. when the respiration failed. Artificial insufflation was always successful in the resuscitation of these failures.

The explosibility of nitrous oxide-oxygen, and normal propyl ethyl ether mixtures was tested with portable apparatus. Analysis showed that more than 1 per cent of the propyl ether had to be present to produce an explosion. Propyl ether explosions seemed less forceful than those of ethyl ether. Samples taken during light third-stage anesthesia showed concentrations of ethyl propyl ether of 1.5, 4, 8, and 17 per cent or just under the explosive concentration.

JOHN E. KRUSE, TRUCK, M.D.

W. Cere, R. M. J. Anoxia; The Anesthetic Point of View. *J. Am. M. Ass.* 1940, 5: 687.

It is important to realize that disturbance of the oxygen supply to the central nervous system is one of the most common deleterious effects of anesthesia.

The anesthetist does well to look upon the physiological mechanisms involved in the delivery of oxygen to the tissues of the body as a simple transport system.

Depression of and obstruction to respiratory exchange are common sequelae of anesthesia and pain therapy. Intelligent management for example the use of artificial alveolar ventilation and the mechanical increase of tidal exchange to prevent disturbance of the oxygen transport and to restore normal transport when possible is necessary secondary to drug administration.

Formanid is formidant. The integrity of the patient's oxygen-transport mechanism should be investigated before pain-relieving drugs are given.

Oxygen therapy (high oxygen tension in the inspired atmosphere) is only one way of treating oxygen want in the tissues. Accurate diagnosis will often point the way to the restoration of normal transport of oxygen, and thereby eliminate the necessity for oxygen therapy. Oxygen under adequate pressure should be administered to void an oxygen deficit, but one should not be lulled into inaction so that one neglects diagnosis, and any treatment which may restore a normal transport mechanism for distribution of oxygen to the cells of the body.

ARMSTRONG F. BAILEY, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Westermarck, N Tuberculosis of the Bronchial Lymph Glands A Roentgenological Investigation *Acta radiol*, 1940, 21 399, 423

The author briefly reviews the literature relating to roentgenological investigations of morbid changes in the pulmonary hilum and calls attention to the frequent misinterpretations and diagnostic errors made on findings observed there. He believes these to be due to indistinct definitions of what constitutes normal hilum images and to the lack of knowledge of the anatomical structures producing them. With a view toward clarifying some of the difficulties, he presents anatomical studies of the pulmonary hilum, pulmonary vessels, and lymphatic system of the lung, and the anatomical basis of the roentgenological appearance of the hilum and lungs. Roentgen technique and interpretations of shadows revealed by exposures in various directions are discussed and illustrated at some length. The localization and distribution of primary tuberculous processes in the lungs and appertinent lymphatic systems as studied by other workers in connection with post-mortem observations and calcified foci revealed roentgenologically are described. The author's own roentgenological investigations into the closer relationship of these conditions are presented in detail with numerous diagrammatic illustrations.

Pathological changes occurring with tuberculosis of the hilum lymph nodes are given brief consideration as an introduction to the roentgen findings which they produce. The extent and stage of development of the disease and possible complications, both of the primary focus in the lungs and of the associated lesions in the appertinent lymphatic systems, determine the roentgenological findings of diagnostic value. The primary focus may be so slight as to produce no demonstrable roentgen changes. It may present as a more or less rounded shadow in the parenchyma with a variable amount of surrounding perifocal infiltration or obstructive atelectasis. In the presence of an acute primary focus in the lung, the regional lymph gland corresponding to the location of the focus is always found to be the seat of changes. These changes may extend secondarily to other connected lymph nodes. In the presence of tuberculosis merely of the bronchial lymph nodes without any visible primary focus, the glandular changes are often bilateral although more pronounced on one side than the other. Pyocaseous hilar adenitis appears in the roentgenogram as larger or smaller confluent glandular masses in which it is impossible to define the individual lymph nodes or groups of nodes from one another. Because calcium phosphate is formed in the caseous lymph nodes, these become denser than the surrounding tissues in the mediastinum. They thus

appear in the roentgenogram not only by virtue of their increased size but also because of their added density.

Various changes due to displacement or compression of the adjacent bronchi or blood vessels are also described and illustrated. Attention is called to the value of the Valsalva experiment and of iodized-oil injections in determining the nature of some of the findings observed.

As regards differential diagnosis, it is only when the lymph nodes have reached such a size as to be directly or indirectly observed that it becomes possible to make a roentgen diagnosis at variance with the normal. Such enlargements may be due to causes other than tuberculosis, among which bronchopneumonia, bronchial carcinoma, benign and malignant lymphogranuloma, and leucemic or pseudoleucemic lymph adenosis are given consideration and points of differentiation mentioned.

A comparative study of the roentgenological and bacillary findings in 365 tuberculin-positive children showed very good correlation between such findings. Detailed data of these cases are included. The author concludes that a careful roentgen examination permits of ascertaining the presence, nature, and extent of the process with considerable accuracy.

ADOLPH HARTUNG, M D

Keys, A, Friedell, H L, Garland, L H, Madrazo, M F, and Rigler, L G The Roentgen Kymographic Evaluation of the Size and Function of the Heart *Am J Roentgenol*, 1940, 44 805

This article is such an exhaustive review of the subject as to warrant the recommendation that it be read in the original by anyone who is interested in kymography.

Planimetric measurement of the area of the postero-anterior projection of the roentgen image of the heart has been repeatedly shown to be the best single measurement for estimating the true size of the heart. It would seem reasonable, therefore, to make such measurements on a kymogram, and thus eliminate the uncertainty of the phase of the cardiac cycle. If the kymogram is used, the planimetric measurements can be made for both systole and diastole, which makes possible the determination of the stroke output.

Extensive studies were made of more than 700 subjects, including normal individuals, athletes, and persons with cardiac disease. The methods used to estimate systolic and diastolic frontal areas are discussed in detail. Simultaneous kymographic and acetylene-rebreathing experiments were carried out to determine the accuracy of the kymographic method. A satisfactorily constant relation was found, and equations were determined. The factors required for the different methods are discussed in detail. The alteration of the stroke output by drugs,



Fig. 1. Kymogram of an athlete, aged 19 years. By Method 1 $\Delta V = 8$ cc, and by Method 2 $\Delta V = 57.4$ cc. The ratio $\Delta V_2/\Delta V_1 = 4$.

the phase of respiration, and cardiac disease have been studied.

Titles of factors are given to facilitate practical application of the methods described.

Figure 1 illustrates a kymogram, and the results of two methods used to evaluate the planimetric measurement of the area of the heart. The area and volume have been determined for systole and for diastole. The volume stroke output is obtained by subtracting the volume in systole from the volume in diastole.

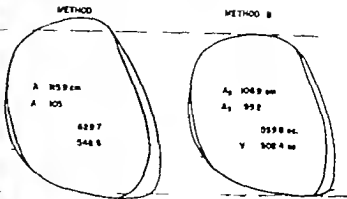
HAROLD C. OGDEN, M.D.

II. HENRI O. The Value of Roentgen Diagnosis in Acute Abdominal Diseases (Ueber den Nutzen von Röntgendiagnostik bei akuten Bauchleiden). *Arch. radiol.* 1930, 47.

The purpose of this address is to emphasize the value of combining the surgeon and roentgenologist diagnostic studies of acute abdominal abnormalities. On account of the urgency the presence of both the surgeon and the roentgenologist is of utmost importance while the pictures are taken and decisions which will be most advantageous to the emergency therapy are made. To get the best results, the roentgenologist should be given all cases of acute abdominal disturbance coming into the hospital for study as it requires much experience to get reliable pictures and to give correct interpretations. Exploratory laparotomies are less numerous as the result of these studies. In Uppsala they have records of thousands of such roentgen pictures—a record not equalled elsewhere. The closest cooperation of the roentgenologist with the surgeon, as well as with the interested hospital staff, is often necessary for the evaluation of negative pictures in order to formulate correct therapeutic deductions. Too much attention cannot be given to this study.

The roentgenograms are of great importance for the following:

In locating unusual appendical positions, especially in children.



For the localization of residual abscesses in diffuse peritonitis complicating appendicitis.

Diagnosis of subphrenic abscesses, gastric ulcers, and perforations.

Diagnosis of pyelonephritis, as well as of hepatic abscesses.

For differential diagnosis between disease of the right terminal ileum and appendicitis this often is difficult even right ovarian cysts may be mistaken for appendiceal masses.

In ureteral calculus versus appendicitis, urography will be decisive.

The different types of ileos can be distinguished roentgenologically from one to two hours after their onset. From 1/2 to 1 cc. of barium may be safely given orally to facilitate the study at the very beginning of the symptoms thus the condition can be recognized almost at once. Hultén believes that barium in small quantities is permissible in nearly all abdominal abnormalities.

Volvulus of the sigmoid flexure and of the cecum, as well as ileocecal invaginations, is easily seen these conditions are often corrected therapeutically by such examinations, especially if small quantities of barium are given orally.

Acute pancreatic affections are often diagnosed on the basis of the changes surrounding the pancreas. However these contiguous changes cannot always be definitely accepted as diagnostic, as other abnormalities which produce similar pictures may be involved. Duodenal enlargement and paresis may be noticed in acute pancreatitis according to the author the so-called paralytic duodenal ileos is of great importance in the clinical picture of this disease.

In the perforation of gall stones into the duodenum, and in perinephritic and traumatic injuries of the abdomen, roentgen examinations are often diagnostic.

In cases of extreme prostration, the attendant naturally must be very cautious to safeguard the strength of the patient avoid rough handling, and

not in any manner unduly expose the patient to further injury

If the roentgen findings are negative, the surgeon should nevertheless proceed as per indications, but with caution

MATHIAS J. SPIFFERT, M.D.

Wangensteen, O. H. The Value of Diagnostic Criteria for the Choice of Therapeutic Procedure in the Management of Acute Intestinal Obstruction, *Experimental and Clinical Observations* Radiology, 1940, 35 680

In the proper interpretation of the significance of intestinal distention, the roentgen findings afford such helpful assistance, that this source of factual information must never be neglected by the clinician. The findings play an important rôle in the choice of therapeutic procedures in the management by helping to determine whether obstruction is present, where the obstruction is located, and whether it is partial or complete.

The value of the roentgen findings is based largely upon the location of the gas distended loops of gut and recognition of characteristics which permit of differentiation between the intestines involved. Whereas in the infant and the young child, gas may be visualized quite regularly throughout the entire length of the bowel, in the adult, visualization of gas in the small bowel is distinctly unusual and signifies intestinal stasis. It is understood now quite generally that the chief source of gas in the obstructed bowel is swallowed air. The extent of bowel distention as revealed by the roentgen examination is a fairly reliable factor of the grade of obstruction. Persistence of gas in the colon after the administration of evacuant enemas in the presence of dilated loops of small intestines suggests the pressure of a partial obstruction in which gas has filtered past the obstructive mechanism.

As regards the technique of the examination, plain or scout films made in the anteroposterior, postero-anterior, or specially indicated positions with the patient reclining may give the desired information. In obstructions of longer standing, in which fluid accumulation within the gut may, in part, obscure the extent of the distention, films made in the sitting or erect posture will indicate more exactly, by the fluid levels or mirrors, the character and extent of the distention present. In all borderline acute conditions of the abdomen, the erect film should always be made to determine the absence or presence of free gas in the peritoneum. Similarly, when the gut has ruptured in obstruction from long sustained increases in intraluminal pressure, an erect film detects the occurrence, although visualization of the external surface of the gut made in the anteroposterior film suggests the same occurrence. Occasionally, the lateral or oblique views give helpful information in determining in which segments of gut the distention has occurred. It is rarely necessary to administer barium to determine the site of the obstruction. In instances in which the feathery appearance of the valvula conniventes cannot with certainty be dif-

ferentiated from the haustrations of the colon, and the clinical information is noncommittal, it may be wise to give a little barium by rectum to aid in the differentiation. The characterless wall of the ileum can usually be distinguished with ease from both the dilated jejunum and colon.

In exceptional instances unusual positions may be indicated. An inverted or upside down position may give valuable information as to the location or extent of the lesion in cases of congenital atresia of the anus or rectum.

Although roentgen findings occasionally are sufficiently characteristic to be diagnostic they may be misleading, and intimate correlation of roentgen and clinical evidence is usually indicated for accurate interpretation.

Among the benefits to be derived from the preliminary roentgen examination combined with clinical observations, the chief one is the frequent ability to separate cases which can be treated successfully without recourse to operative intervention from those in which prompt operation is imperative. The effects of decompression by conservative means may also be followed by repeated roentgen observations and the absence of favorable results may suggest the need for other methods of treatment.

ADOLPH HARTUNG, M.D.

Steinert, R. The Roentgen Picture of Rectal Narrowing in Lymphopathia Venerea (Die Rectum verengung bei Lymphopathia venerea und ihr roentgenologisches Bild) *Acta radiol*, 1940, 21 368

It is amazing that the roentgen findings showing the characteristic picture of rectal narrowing in lymphopathia venerea are so seldom mentioned in the literature. The reasons are that this disease is relatively little known to date, only a few cases having been reported, and, above all, it belongs to the domain of venereology and surgery.

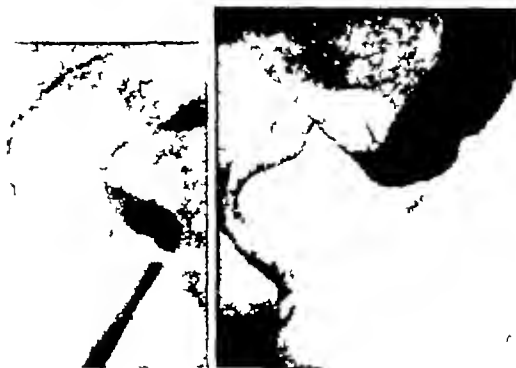


Fig. 1 Left, The large distance between the os sacrum and the rectum.

Fig. 2 The threadlike part of the rectal narrowing of the same case after it was cautiously inflated.

It usually begins with mild herpetiform desquamation of the skin from one to three weeks after coitus. One to two weeks later strumous bubos, from the size of that of chicken egg, appear in the groins. They rupture and leave characteristic scars. This may also occur independently of coitus if it is caused by virus that can be cult red and need it demon trated. The sickness may disappear spontaneously without bubo formation and less so scars.

On the basis of Frei reaction lymphopathia venerea is identical with the tropical bubo. It is assumed that sailors infected in the tropics brought the infection to Scandinavia. It is now more prevalent in Europe than before the World War. In addition to the local symptoms, meningeal complications, pyrexia, hepatic disturbances, exanthema, protracted joint diseases, oral and laryngeal involvements, and lat narrowing of the rectum may occur. Syphilis and various other etiological factors were named as the cause of this disease, but Frei in 1913 could prove that patients with benign rectal narrowing reacted positively to his antigen. Jersild claims elephantiasis genito-anorectalis occurs in this disease principally in men and that rectal narrowing is more common in women. Jersild stated that 80 per cent of all the rectal narrowing occurs in women, and that this is due to the fact that infection takes place in the posterior vaginal wall and the posterior commissure perineum, and thus, from which location the lymph channels lead directly to Gerota's glands which lie in the rectal wall about 5 cm. from the anus. The infections in the male occur in the penis whence the lymphatics lead laterally to the inguinal glands and do not receive any lymph from the perineum nor from the cutaneous part of the anus. Most men afflicted with this disease were supposedly passive pederasts. The theory of lymph stasis in the glandular system gave way to the theory of lymphangitis as a cause of this sickness. Steinhert reported 7 patients with rectal narrowing 3 women and men, all of whom reacted positively to the Frei antigen test. One patient was encountered at the Kommunale Krankenhaus in Kristiansand, 3 in the Krankenhaus Ullevål, and in Reich Hospital, Oslo.

All of these patients had several symptoms in common: very slowly progressing clinical history of disease with, at times, painful defecation, bloody purulent and mucous discharges, pruritus, tenesmus, intermittent constipation, and then acute obstruction. The general condition of these patients was often complicated with other diseases. They were wasted, haggard, anemic, feverish, and greatly depressed. All these symptoms showed that lymphopathia venerea is very dangerous if left. Most of the patients die before they reach fifty years old. The non-treated patients die and others must submit to colostomy or other painful procedures.

The roentgen rays also show many common traits of the disease: the rectum appears as more or less rigid tube with necrotic or untravelling walls from

which fistulous passages extend into blind pouches or abscessed pockets. The usual ampullar widening of the rectum is absent and its elasticity is lost or greatly reduced. The great distance between the rectum and the os sacrum is very remarkable and characteristic feature of this disease.

Leucorrhoea, gonorrhoea, and even tuberculosis are frequent complications that sometimes lead to a false diagnosis. One cannot easily be mistaken for lymphopathia venerea. When the diagnosis is on certain the roentgen study should be followed by the Frei test. The abnormally widened space between the rectum and the os sacrum is characteristic feature of the disease—but not only a stereoposterior but also lateral exposure should be made.

MANNING J. SCHEPPE, M.D.

Barberis, A. Roentgen investigation of Ureterocoele (L. Iodagie radiologica nell ureterocoele) *Radiol med* 940, 7 687.

Most authors think that ureterocoele is congenital, or rather that the conditions favoring the development of the anomaly are congenital. Ureterocoele has been reported with equal frequency in the two sexes and at all ages. It is usually unilateral, but may be bilateral in rare cases. The lumen of the ureterocoele may be occupied by urine, products of excretion, or calculi. The first roentgen picture of ureterocoele as described by Leonard and it is as compact and is still the only one which can be relied upon with security for the recognition of the defect. Descending urography is the only method that is capable of getting all the necessary data to make the roentgen diagnosis; however there are some conditions under which the dilatation cannot be demonstrated even by means of this method. For instance, when the ureterocoele is filled with thick pus or is occupied by roentgen transparent calculi, then the corresponding kidney does not eliminate opaque urine or when the proximal urinary tract is enormously dilated (hydronephrosis) and the opaque urine is therefore diluted by such large quantity of fluid that it becomes roentgenologically unrecognizable. Evidently the technical rules for the execution of accurate descending urography must be strictly observed and numerous films must be taken during the various phases of the elimination of opaque urine in order to catch the picture of the lower part of the ureter in various filling and emptying aspect.

Barberis describes his observations in 4 cases. The first case in a child aged five years, is interesting because it supports the theory of the congenital origin of ureterocoele. The roentgen picture showed the left lateral opening narrow rounded filling defect in the center of which was projected the os of the terminal extremity of the ureter which showed signs of dilatation. The right ureter presented only slight incomplete halo which was difficult to interpret because of the presence of gas in the adjacent parts (Fig. 1). The second case, in a man aged twenty-four years, presented bilateral ureterocoele with calculi on both sides. The third case is in a

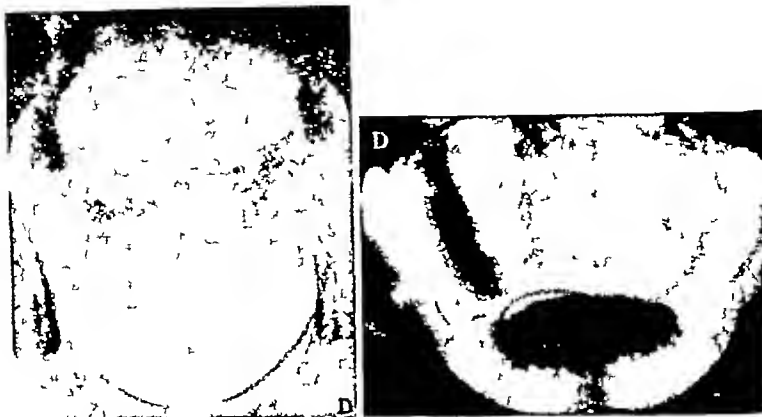


Figure 1 Left, First case Indication of bilateral ureterocele
Figure 2 Third case Large unilateral ureterocele, second phase of elimination of opaque urine

aged thirty-five years, was distinguished by one of the largest unilateral ureteroceles described up till now (Fig 2) the cavity was free of foreign substances so that it filled completely with opaque urine. The fourth case, in a child aged two years, showed a slight dilatation of the lower extremity of the left ureter surrounded by a narrow, transparent halo, this could have been a ureterocele. The marked nearness of the two ureteral orifices in the second case and the presence of other anomalies in the third case (bifid renal pelvis and anomaly of the lumbar spine) also support the theory of congenital origin of ureteroceles.

The roentgen signs of ureterocele in the order of their importance are (1) the appearance at the site of the ureter of an opaque intravesical spot, surrounded by a narrow, transparent halo with clear limits and in the form of a circle, or with an interruption in its upper lateral portion (picture of Lenarduzzi), (2) the appearance of a transparent halo, with clear limits and in the form of a U embracing the lower extremity of a ureter which is uniformly dilated and protrudes into the vesical cavity, (3) the appearance at the site of the ureter of a roundish, intravesical filling defect (sign of Rossoni and Wuellenweber), eventually of varying volume (sign of Mingazzini), (4) the appearance at the site of the ureter of a grossly hemispheric filling defect (sign of Turano), and (5) the appearance of a transparent halo, with clear limits, around the shadow of an intravesical roentgen opaque calculus (sign of Åkerlund). The first or the second picture allows making the diagnosis of ureterocele with certainty, the other signs must be confirmed by cystoscopic examination.

During the past year, the author has discovered 4 ureteroceles in 206 descending pyelographies and 7 ureteroceles in 246 cystoscopies, but 3 of the latter 7 cases had not been submitted to roentgen examination. The practical value of roentgenography and of cystoscopy for the diagnosis of ureterocele is conse-

quently about the same, but each of the two examinations has its own particular indications. The success of the first depends on the accuracy of the technique and on the renal function, and that of the second on the local anatomical conditions, especially those of the vesical mucosa. RICHARD KEMEL, M D

Hill, H A, and Sachs, M D. The Grooved Defect of the Humeral Head, A Frequently Unrecognized Complication of Dislocations of the Shoulder Joint. *Radiology*, 1940, 35 690

The fact that available sources of information had failed to disclose the origin of a large defect or groove in the posterolateral aspect of the head of the humerus which is noted on roentgenograms of traumatized shoulders induced the authors to make a detailed study of the literature and of 119 cases of dislocated shoulder reviewed by them. This led to a clarification of their original conceptions regarding the nature of this lesion and identified it not as a late result of dislocation, but as a true fracture.

The literature relating to shoulder dislocations is reviewed briefly and a "typical defect" mentioned by various observers in connection with resected heads is summed up in the following description: the defect is located posteriorly and medially to the greater tuberosity on the posterolateral aspect of the articulating surface of the humeral head. The groove is navicular or wedge-shaped and its average measurements are 2.5 cm in length (cephalocaudad), 1.5 cm in width, and 0.75 cm in depth. The defect is demarcated from the surrounding normal bone by sharp or vertically projecting walls, which in the larger defects stand at right-angles to each other. The spongiosa bordering the defect is thicker than elsewhere and is covered with a glossy, smooth layer of connective tissue. No fragment avulsed from the humerus is to be seen.

Since more conservative methods have displaced resection as a method of treatment for habitual

It usually begins with a mild herpesiform desquamation of the skin from one to three weeks after coitus. One to two weeks later a numerous bubo, from the size of but that of a chicken egg, appears in the groins. They rupture and leave characteristic scars. This may also occur independently of coitus. It is caused by a virus that can be cultured and readily demonstrated. The sickness usually disappears spontaneously without bubo formation and leaves no scars.

On the basis of Frei's reaction lymphopathia venerea is identical with the tropical bubo. It is assumed that sailors infected in the tropics brought the infection to Scandinavia. It is now more prevalent in Europe than before the World War. In addition to the local symptoms, meningeal complications, pyrexia, hepatic disturbances, exanthema, protracted joint diseases, oral and laryngeal involvements, and lat narrowing of the rectum may occur. Syphilis and various other etiological factors were named as the cause of this disease, but Frei in 1913 could prove that patients with benign rectal narrowing reacted positively to his antigen. Jersild claims elephantiasis genitalis-anorectalis occurs in this disease principally in men and that rectal narrowing is more common in women. Jersild stated that 80 per cent of all the rectal narrowing occurs in women, and that this is due to the fact that infection takes place in the posterior vaginal wall at the posterior commissure, perineum, and anus, from which location the lymph channels lead directly to Gerota's glands which lie in the rectal wall about 5 cm. from the anus. The infections in the male occur in the penis whence the lymphatics lead laterally into the inguinal glands and do not receive any lymph from the perineum nor from the cutaneous part of the anus. Most men afflicted with this disease were supposedly passive pederasts. The theory of lymph stasis in the glandular system gave way to the theory of lymphangitis as cause of this sickness. Sternert reported 7 patients with rectal narrowing 5 women and 2 men all of whom reacted positively to the Frei antigen test. One patient was encountered at the Kommunale Krankenhaus in Kristiansund in the Krankenhaus Ullevål, and 1 Reich Hospital, Oslo.

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high fistulous passages extend into blind pouches or baccated pockets. The usual ampulla widening of the rectum is absent, and its elasticity is lost or greatly reduced. The great distance between the rectum and the os sacrum is very remarkable and characteristic feature of this disease.

Lues, gonorrhea, and even tuberculosis are frequent complications that sometimes lead to false diagnosis. Cancer cannot easily be mistaken for lymphopathia venerea. When the diagnosis is a certain the roentgen study should be followed by the Frei test. The abnormally widened space between the rectum and the os sacrum is a characteristic feature of the disease—but not only an anteroposterior but also lateral exposure should be made.

MATTHEW J. SEITZ, M.D.

Barbieri, A. Roentgen investigation of Ureterocoele (L. iodogon radiologica nell' ureterocoele). *Radiol med.* 1924, 7: 687.

Most authors think that ureterocoele is congenital, or rather that the conditions favoring the development of the anomaly are congenital. Ureterocoele has been reported with equal frequency in the females and in all ages. It is usually unilateral, but may be bilateral in rare cases. The lumen of the ureterocoele may be occupied by urine, products of erosion, or calculi. The first roentgen picture of ureterocoele as described by Leonarduzzi was complete and it still the only one which can be relied upon with security for the recognition of the defect. Descending urography is the only method that is capable of giving all the necessary data to make the roentgen diagnosis; however there are some conditions under which the dilatation cannot be demonstrated even by means of this method (for instance when the ureterocoele is filled with thick pus or is occupied by roentgen transparent calculi when the corresponding kidney does not eliminate opaque urine or when the proximal urinary tract is enormously dilated (hydronephrosis) and the opaque fluid is therefore diluted by such large quantity of fluid that it becomes roentgenologically unrecognizable. Evidently the technical rules for the execution of accurate descending urography must be strictly observed and numerous films must be taken during the various phases of the elimination of opaque fluid in order to catch the picture of the lower part of the ureter in all various filling and emptying aspects.

Barbieri describes his observations in 4 cases. The first case in a child aged five years is interesting because it supports the theory of the congenital origin of ureterocoele. The roentgen picture showed at the left ureteral opening a narrow rounded filling defect, in the center of which was projected the image of the terminal extremity of the ureter which showed signs of dilatation. The right ureter presented only slight incomplete halo, which was difficult to interpret because of the presence of gas in the adjacent parts (Fig. 1). The second case, in a man aged twenty-four years presented bilateral ureterocoele with calculi on both sides. The third case in a man

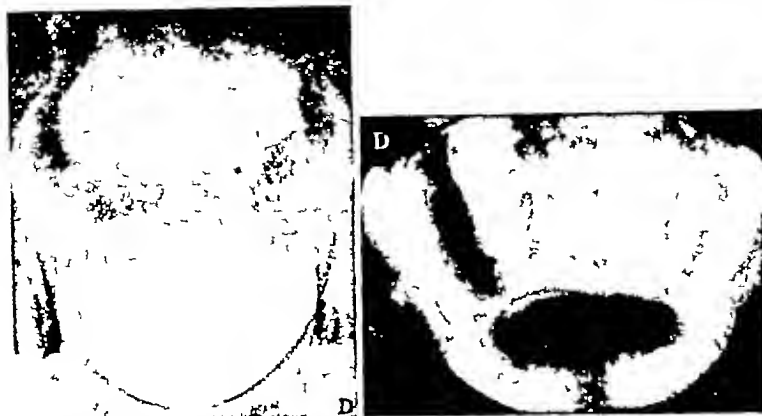


Figure 1 Left, First case. Indication of bilateral ureterocele
 Figure 2 Third case Large unilateral ureterocele, second phase of elimination of opaque urine

aged thirty-five years, was distinguished by one of the largest unilateral ureteroceles described up till now (Fig 2) the cavity was free of foreign substances so that it filled completely with opaque urine. The fourth case, in a child aged two years, showed a slight dilatation of the lower extremity of the left ureter surrounded by a narrow, transparent halo, this could have been a ureterocele. The marked nearness of the two ureteral orifices in the second case and the presence of other anomalies in the third case (bifid renal pelvis and anomaly of the lumbar spine) also support the theory of congenital origin of ureteroceles.

The roentgen signs of ureterocele in the order of their importance are (1) the appearance at the site of the ureter of an opaque intravesical spot, surrounded by a narrow, transparent halo with clear limits and in the form of a circle, or with an interruption in its upper lateral portion (picture of Lenarduzzi), (2) the appearance of a transparent halo, with clear limits and in the form of a U embracing the lower extremity of a ureter which is uniformly dilated and protrudes into the vesical cavity, (3) the appearance at the site of the ureter of a roundish, intravesical filling defect (sign of Rossoni and Wuellenweber), eventually of varying volume (sign of Mingazzini), (4) the appearance at the site of the ureter of a grossly hemispheric filling defect (sign of Turano), and (5) the appearance of a transparent halo, with clear limits, around the shadow of an intravesical roentgen opaque calculus (sign of Akerlund). The first or the second picture allows making the diagnosis of ureterocele with certainty, the other signs must be confirmed by cystoscopic examination.

During the past year, the author has discovered 4 ureteroceles in 206 descending pyelographies and 7 ureteroceles in 246 cystoscopies, but 3 of the latter 7 cases had not been submitted to roentgen examination. The practical value of roentgenography and of cystoscopy for the diagnosis of ureterocele is conse-

quently about the same, but each of the two examinations has its own particular indications. The success of the first depends on the accuracy of the technique and on the renal function, and that of the second on the local anatomical conditions, especially those of the vesical mucosa. RICHARD KEMEL, M D

Hill, H A, and Sachs, M D. The Grooved Defect of the Humeral Head, A Frequently Unrecognized Complication of Dislocations of the Shoulder Joint. *Radiology*, 1940, 35 690

The fact that available sources of information had failed to disclose the origin of a large defect or groove in the posterolateral aspect of the head of the humerus which is noted on roentgenograms of traumatized shoulders induced the authors to make a detailed study of the literature and of 119 cases of dislocated shoulder reviewed by them. This led to a clarification of their original conceptions regarding the nature of this lesion and identified it not as a late result of dislocation, but as a true fracture.

The literature relating to shoulder dislocations is reviewed briefly and a "typical defect" mentioned by various observers in connection with resected heads is summed up in the following description: the defect is located posteriorly and medially to the greater tuberosity on the posterolateral aspect of the articulating surface of the humeral head. The groove is navicular or wedge-shaped and its average measurements are 2.5 cm in length (cephalocaudad), 1.5 cm in width, and 0.75 cm in depth. The defect is demarcated from the surrounding normal bone by sharp or vertically projecting walls, which in the larger defects stand at right-angles to each other. The spongiosa bordering the defect is thicker than elsewhere and is covered with a glossy, smooth layer of connective tissue. No fragment avulsed from the humerus is to be seen.

Since more conservative methods have displaced resection as a method of treatment for habitual

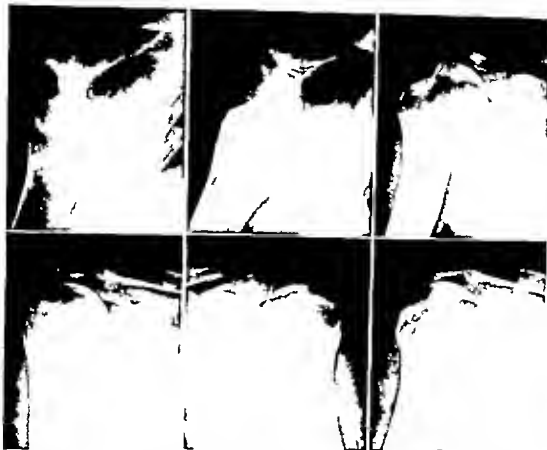


Fig. Upper left, Nov. 8, 1937. Subcoracoid dislocation of the right humerus; view in external rotation shows no groove. upper center [case 57] 1938. X-ray made following re-dislocation, with the humerus rotated slightly externally reveals slight flattening of the superior-lateral contour of the head. upper right, Sept. 22, 1938. Following correction of the third dislocation, large groove is visible when the humerus is in marked internal rotation. lower

left, Oct. 1938. The right humerus is in external rotation, routine projection, showing no visible defect. lower center Oct. 1938. The left humerus is in internal rotation for comparison with the right, no groove present. lower right, Oct. 1938. The right humerus in marked internal rotation, this projection clearly reveals the large defect which was "hidden" in the routine view. (This case presented through the courtesy of J. Minton M.D., Meria, M.D.)

shoulder dislocations, the defect is frequently not discovered at operation, but roentgen studies, if properly made, will reveal it. The mechanism involved in producing it and the technique necessary to demonstrate it are described in detail. An anteroposterior projection made with the arm in marked internal rotation is essential, and in a small percentage of cases the defect will be disclosed only by means of a tangential view of the posterolateral aspect of the humeral head. In this position the defect is revealed as a compression fracture having the following roentgen characteristics:

Flattening of the contour of the articular surface or in larger defects, indentation, excavation, or groove on a level with the greater tuberosity

2. A sharp, dense line running downward from the top of the humeral head, parallel to the axis of the shaft and somewhat lateral to the mid line (This "line of condensation" is a special sign, and is the result of the compression or compaction into a narrow medial border of the spongy bone previously occupying the space of the defect.)

3. The floor of the defect (best seen in the tangential view) showing dense compacted bone.

A number of detailed case reports with illustrative roentgenograms are included and the findings in connection with the 10 cases at hand are tabulated. The authors believe that recognition of the compression-fracture defect, in addition to its obvious medicolegal importance, should lead to better results in

the treatment of shoulder dislocations and disabilities
ADOLPH HARTUNG, M D

Baastrup, C I The Diagnosis and Roentgen Treatment of Certain Forms of Lumbago
Acta radiol, 1940, 21 151

The disease called spinous process lumbago by the author is described. Pressure of the lumbar and first sacral spinous processes on each other causes injury to the interspinous soft tissues and the development of pathological conditions which may or may not be visible roentgenologically. Strong pressure may be caused by several factors, namely, increased lumbar lordosis, increased volume of the spinous processes, shrinking of the vertebral bodies and intervertebral discs and spondylosis deformans. Rapid movement or effort may produce an acute interspinous lesion.

The most frequent direct causes of pain are tension in hematomas, reactive edema, and perhaps some irritative process in the periosteum or ligaments. Protracted muscle contraction is the most common secondary cause. These factors cannot be demonstrated roentgenographically. Osseous changes are probably a direct cause of pain to a much lesser extent. This may explain why there may be no pain with extensive osseous changes, whereas pain may be severe with no demonstrable x-ray lesions. Evidence that the seat of this lumbago lies in the interspinous tissues rather than in the muscles themselves is presented. In spinous process lumbago an injection of novocaine between the processes would often stop an acute or chronic attack, whereas injection of the contracted painful muscles would not.

The treatment of acute spinous process lumbago is the same as that employed in ordinary acute backache, namely, heat, rest, and analgesics. In chronic cases physical therapy should be tried, and if ineffective, roentgen therapy should be instituted. The results of roentgen treatment of 43 cases of chronic lumbago are reported. In most cases three doses of 300 roentgens were given at intervals of six weeks. Of a total of 16 men, 12 showed improvement, and of a total of 27 women, 21 showed improvement. The effect of radiation is analgesic not curative. Due regard is given to the uncertainties involved in evaluating back pain and its relief.

JOHN L. LINDQUIST, M D

Deucher, W G Myeloscopic and Myelographic Observations in Prolapse of the Posterior Portion of the Intervertebral Disc Causing Sclerotic (Myeloskopische und myelographische Befunde bei Bandscheibenprolapsen) *Acta radiol*, 1940, 21 164

Deucher discusses the symptoms of prolapse of the posterior portion of the intervertebral disc, which occur usually in the lower extremities, and insists on the importance of the anamnesis. The cerebrospinal fluid should be examined in all suspected cases. An increase in the total albumin content above 40 mgm per 100 c cm is often found. A lateral roentgen exposure is also indicated although it does not allow

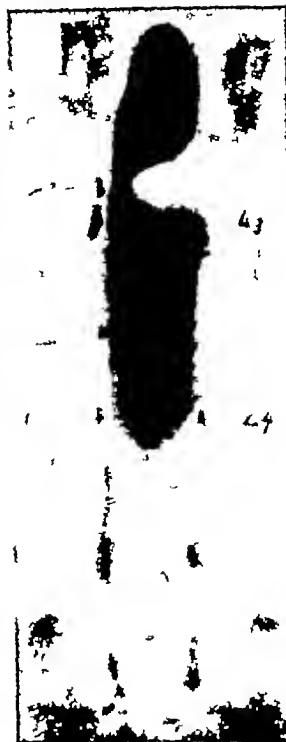


Fig 1 Unilateral prolapse of intervertebral disc L 2 3 Exposure in abdominal position of the patient

the making of the diagnosis of prolapse, it may reveal other processes of the vertebrae which compress the dural sac, and it has some diagnostic significance if it shows a unilateral decrease in height of the intervertebral disc corresponding to the side on which the symptoms are most marked, and at the correct level. When prolapse is suspected, the diagnosis can be cleared up and the exact site of the process established only by myelography.

Five cubic centimeters of lipiodol are injected into the subarachnoid space through a lumbar puncture, and the patient is examined in abdominal position on a table that can be tilted to an angle of 45 degrees to the horizon. If a defect is discovered, the examination is repeated in the oblique abdominal and in the lateral positions and then in dorsal decubitus. As a rule, the prolapse can be recognized only in the abdominal and in the oblique abdominal positions and is found in most cases in the lumbar region. It appears as an extradural tumor under the form of a rounded defect which protrudes like a tooth into the lipiodol shadow of the subarachnoid sac and strongly reduces the width of the shadow at this level. The defect is sharply delimited in all directions and is unilateral in most cases, although it may pass the middle line, it corresponds to an intervertebral disc and has about the same height, but its base is often

wider because of the fact that the dura bridges the sharp angle present between the prolapse and the neighboring border of the vertebral body (Fig. 3). In addition, the roentgenogram often shows the edematous swelling of an efferent nerve by broadening of the negative shadow of its root. A defect in the lipiodol column is significant only when it is constant.

Three cases of prolapse diagnosed at the Department of Roentgenology of the University of Zurich are reported; all were operated upon successfully by laminectomy and removal of the prolapsed part of the disc.

RICHARD KESSEL, M.D.

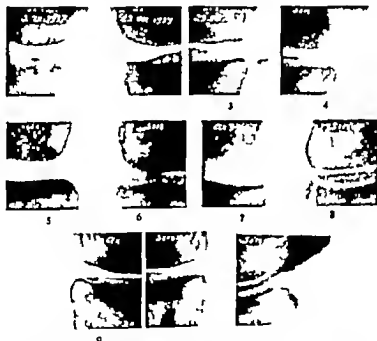
Lindblom, K. Roentgenographic Evidence of Meniscal Lesions in the Knee Joint. *Ann. Radiol.* 9:25, 1974.

This study of meniscal lesions evaluates the changes observed in plain roentgen films and the more definitive findings of contrast arthrography. In most instances operative confirmation of the x-ray diagnosis was obtained.

For contrast studies of the knee joint the use of iodized oils and thorotrast are justifiably condemned. If, on the other hand, water-soluble iodine salts are used in a non-irritating or only slightly irritating form, Lindblom makes no more objection than to the use of air or oxygen. The salts have an advantage in that they mix with the fluid left in the joint. The addition of gas after the injection of positive medium makes judgment more difficult.

The author believes, in contrast to Scher, that there is a high frequency of roentgenological signs of local arthrosis in cases of meniscal lesions and that the arthrosis is probably secondary to the meniscal lesion. His material consists of 75 cases in which arthrography was done and 56 cases plus the same 75 cases in which direct roentgen studies without contrast media were made. The technique is described in some detail as to position and views.

Before arthrography, synovial fluid present is pressed out and about 0.5 c.c. of 35 per cent perabrodil are injected. Movements are then made to spread the



Figs. 1-4. Roentgenograms and arthrograms showing development of bony changes in case of meniscal lesion. Figs. 1 and 2 show the medial part of left knee one month after injury and one and one-half years later; arrow marks osteophyte. Fig. 3 represents the arthrograms of left knee before operation; arrow marks fissure in the posteromedial portion of medial meniscus.

Figs. 5-8. Roentgenograms and arthrograms of cases of arthrotic meniscal lesions showing arthrosis of injured knee (arthrograms) and normal conditions in the other knee (roentgenograms).

Figs. 9-10. Roentgenograms and arthrograms of case four weeks after injury of left knee. Compare appearance of right and left tibial condyle (Figs. 9 and 10). Fig. 10 illustrates a fissure in the anteromedial portion of medial meniscus.

medium, and a compression handage is applied over the suprapatellar recess. Roentgen examination is made as quickly as possible because of the rapid resorption of the medium. No complications arose other than a slight, dull ache in isolated cases during the first half-hour after injection or a little exudate in the first twenty-four hours.

The arthrographic evidence of a meniscal lesion was (1) contrast filling of a fissure (35 cases), (2) partial defect of the meniscus (10 cases), (3) interposition of the pathological soft tissues between the condyles (2 cases), and (4) a combination of findings (4 cases). A significant observation was that most fissures of the medial meniscus seemed to originate from the inferior surface, which should be carefully examined at operation. For the purpose of diagnosis the finding of a fissure has greater significance than the appearance either of a partial meniscal defect or of interposition of soft tissue.

The changes observed in the direct roentgen picture showed that, as a rule, the arthrosis was confined to, or was more pronounced on, the side of the joint where the meniscal lesion was observed. When the two knee joints were compared, it was found that the affected side more often showed roentgenological signs of arthrosis. In early cases this change consisted only of an osteophyte on the tibial condyle near the cartilage edge. In chronic cases osteophytes were present on both the tibia and femur, and sometimes there was recession of the height of the articular cartilage and subchondral sclerosis. In general, osteophytes did not appear until a few months or years after the injury or beginning of the lesion. The tendency to develop such arthrosis increases with age.

The author concludes that as a result of a meniscal lesion an osteophyte usually appears on the adjacent tibial condyle after a short time. By comparison with the healthy side, it is possible to detect this arthrosis at an early stage. Confirmation of a meniscal lesion can be obtained by arthrography in the majority of cases, fissures of the meniscus being the most important sign. JOHN L. LINDQUIST, M.D.

Krogdahl, T. Roentgen Diagnosis of Dislocation of the Menisci of the Knee Joint without the Use of Contrast Media (Roentgenologische Diagnose der Menisksluxation im Kniegelenk ohne Verwendung von Kontrastmitteln). *Acta radiol.*, 1940, 21: 335.

Under normal circumstances the articular surfaces of the tibia and femur touch the menisci of the knee joint or each other, and there is no "tissue-free" space between them. Nordheim has shown that such a tissue-free space, presumably containing gas under low pressure, can be produced by traction, and shown as a cleft on roentgen plates.

The technique in Krogdahl's studies follows.

The legs are extended, and the knees fastened to each other by a linen handage. The lower legs are abducted by traction on the ankles in a knock-kneed position. The patient must not flex the knees or

rotate in the hip joints. The exposure is done according to the technique used in ordinary anteroposterior pictures, however, the central beam should form an angle of from 75 to 85 degrees, open toward the head. Soft rays and short exposure should be used.

The method is diagnostically useful in that it discloses minimal amounts of fluid in the joint. No gas space is visible if there is blood or free fluid present.

Normally the distance from the femur to the tibia increases under forced knock-kneed abduction, but not more than 2 or 3 mm. A larger increase points to rupture of the capsule and/or of the collateral ligament, especially when there is only a unilateral excess increase. A diagnosis of meniscus lesions by this method is possible only if there is no free fluid in the joint.

Eighteen patients with a possible meniscus lesion were studied. In 2 of them the lateral meniscus was involved, and the method failed. In 10 of the remaining 16 patients the articular cleft could not be shown, however, 6 of these had considerable amounts of fluid in their knees. In 2 more patients there was a marked increase of the medial bone distance which suggested the diagnosis of rupture of the capsule. In 6 patients, there was distinct visualization of the articular cleft and meniscus. In 2 of these patients the meniscus findings were normal. A third patient showed doubtful findings, and in 3 patients (4 knees) the diagnosis of luxation of the meniscus was made definitely. As this diagnosis never has been made to date without contrast substances, these cases are reported in detail, and 1 report is given here.

A boy of eighteen had a history and findings typical for a medial meniscus lesion of the right knee. Ordinary roentgen pictures were negative. Pictures made according to Nordheim's technique showed a normal wedge shaped medial meniscus on the left side (Fig. 2) and a shortened meniscus with the free margin "cut off" on the right side (Fig. 1). Operation affirmed the diagnosis. HEINRICH LAMM, M.D.

RADIUM

Pohle, E. A., and McAneny, J. B. Radium Treatment of Vascular Nevi. *Am. J. Roentgenol.*, 1940, 44: 747.

Vascular nevi may, for practical purposes, be grouped according to the simple classification of MacKee. He divided the vascular nevi into nevus flammeus (portwine mark), nevus vasculosus (strawberry mark), and angioma cavernosum (cavernous angioma). There are, of course, many mixed types.

The cause of vascular nevi is still debated. Ribbert's theory, which assumes their development from embryonic rudiments, is most plausible.

As to the optimum time of treatment, the consensus of opinion is that the earlier the treatment is given the better, but it should certainly be given during the first year of life. The most satisfactory results are being obtained, except in the case of the portwine mark, from the use of radium.

The authors, after briefly reviewing the various methods of radium therapy applied most commonly describe their own method, which is somewhat individualized from case to case, although as a rule doses leading to an erythema are avoided. For superficial lesions, plaques with 0.2 mm. aluminum filtration are used. A 1 by 2 cm. plaque can be applied for up to an hour on an area of 1 cm. and correspondingly less for a larger area down to ten or fifteen minutes. Treatment may be repeated with four to eight weeks if necessary. For lesions thicker than 0.5 cm. or subcutaneous angiosarcomas radon screens filtered with 0.5 mm. silver and 1 mm. brass or 1 1/2 mm. brass alone are employed, placed on wood applicators or dental compound molds from 1 to 3 cm. thick, so as to obtain a certain distance and thus a more uniform distribution of the irradiation. The dose varies according to the thickness of the lesion from 20 to 4 m.c. hr. but a single dose of 300 m.c. hr. at 3 cm. distance is never exceeded. If the lesion extends over a large area, multiple applications with smaller fields are used, which leaves a margin of from 3 to 4 mm. between the fields. In such cases an interval of from three to six months is allowed between treatments.

During the last two years, angiomatous cervix have occasionally been treated by radium punctate. Needles 5 cm. long with 1 mgm. radium element content and wall thickness of 0.5 mm. of platinum are inserted radially from 1 to 5 cm. apart and retained in situ by sutures for forty-eight hours.

A series of 146 cases of vascular and carcinomatous cervix is analyzed as to the final results. According to the figures compiled, 60 per cent of the patients were definitely cured and most of the others were benefited. The percentage of failures was very small, amounting to only 3 per cent.

T. LUTCHER, M.D.

Nielsen, J. Clinical Studies on the Irradiation Treatment of Cancer of the Esophagus (Klinische Versuche zu Strahlenbehandlung des Speiseröhrenkrebses). *Acta radiol.* 940, 1932.

Nielsen reports on 54 cases of cancer of the esophagus treated from 1913 to 1932 in the Radium

Station in Copenhagen. He divides them into two groups: the first was treated before 1921 chiefly palliatively—gastrostomy was frequently done on these patients and they all died in a short time. The second group was treated after 1921 with more intensive radiation; curative treatment was attempted in 7 of these patients. Coeurd method of fractionated protracted irradiation was tried. The results in this group were marked shrinkage of the tumor with frequent restitution of swallowing at least for some time. Eight patients survived longer than one year. Three of these appear clinically free of recurrence, and so far represent 3 cases of long year-cure and 1 of three year-cure. In addition there is 1 patient classified as having had cancer of the hypopharynx with a six and one-half year-cure who probably should be classified as having had carcinoma high up in the esophagus. Coeurd method is so effective in carcinomas high up in the esophagus that Nielsen believes its employment to be mandatory.

In intrathoracic tumors the technique is more difficult, and the treatment is very hard on the patients. In the selected patients who are strong enough to undergo the treatment, Nielsen supplements the roentgen dose (10,000 to 40,000 roentgens) with small radium doses applied internally. Radium treatment alone is not curative treatment of cancer of the esophagus. Besides, radium treatment is dangerous because of the possibility of perforation.

Tumors of the upper part of the esophagus are treated like hypopharynx tumors. Usually from 3 to 7 fields are used, including fields from the back. The doses range from 50 to 200 roentgens per treatment, and usually two treatments are given daily. The total dose is from 6,000 to 10,000 roentgens. The author uses 80 kv. 6 ma. 50 cm. for distance, and the Thoracos filter. The average treatment time is from six to seven weeks. If 20 per cent of the cures high in the esophagus can be expected with further development of irradiation technique. Before high voltage machines are available there is but little hope to improve the results of irradiation of lower esophageal cancers. H. H. LUND, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Fingerland, A Amebiasis of the Skin. A Contribution to the Etiology of the So-Called Postoperatively Progressing Gangrene of the Skin (Amoebiase der Haut. Beitrag zur Aetiologie der sogenannten postoperativ-fortschreitenden Hautgangraen) *Časopis lékař česk*, 1940, p 705

Tropical dysentery may not only be introduced but occurs also endemically in temperate and cold zones. It appears often under forms which deviate greatly from the classical picture, with or without diarrhea, as undetermined abdominal disturbances, as suppurating and non-suppurating processes of the liver, as metastatic abscesses of the brain and spleen, as ulcerating inflammation of the urinary tract, and also as severe, progressing ulceration of the skin. Therefore, the term of amebiasis of the skin has been used lately. It occurs under the following forms: (1) after operations, under the picture of a progressive gangrene in the neighborhood of the wound, (2) after spontaneous perforation of amebic abscess, mostly localized in the skin of the abdomen or chest, (3) spontaneous origination in the neighborhood of the anus, and (4) without relation to old processes, but most probably due to hematogenous metastases.

The most frequent form is that of postoperative, progressing gangrene which occurs in most cases as a complication after abdominal interventions. Its period of incubation varies from two to sixty days, but is generally barely fourteen days. The amebiasis usually begins in the vicinity of the wound as a red spot in which a nodule soon forms and then ulcerates. The ulcer spreads 2 or 3 mm each day and may reach a diameter of 50 cm, however, it does not extend in depth, but stops at the fascia. The edges of the wound are extremely sensitive even to the slightest touch. The regional lymph nodes are not involved. Usually, the temperature does not exceed 38.5° C, but the leucocytosis may reach 20,000. The only treatment to be considered is extensive excision far into the healthy tissues and including the base of the ulcer.

The author describes a case in a man who contracted real amebic dysentery in Siam and presented continuous disturbances for twenty-four years. At first he was treated for gastric ulcer and then for ulcerating colitis, finally, he had such severe stenosis of the sigmoid that, because of ileus, a colostomy had to be performed. Amebiasis of the skin developed from the borders of the wound. The correct diagnosis was made only at autopsy by the demonstration of the presence of the entamoeba histolytica in the wound and the intestinal ulcers.

The author points out that postoperative, progressing ulcerations must always be suspected of amebiasis and that a search for amebas is in order

in such cases. There is also the possibility of amebic embolism. The main diagnostic elements are the laboratory examinations: (1) of the stools and the secretions of the ulcer for vegetative forms of amebas, (2) of the stools for cysts of amebas, (3) attempts at transmission to cats, (4) attempts to obtain an ameba culture, and (5) (exceptionally) microscopic examination of the tissues. The article is accompanied by beautiful illustrations of the amebas. (GOLLA) RICHARD KEMEL, M D

Schuberth, O Shock and Blood Transfusion (Shock und Bluttransfusion) *Svenska läk-tidning*, 1940, p 900

Shock in the sense of collapse (as used by the author) is brought about when certain physiologico-anatomical factors that regulate the circulation of the blood are negated or too greatly exaggerated, so that the least amount and the least pressure of blood drop so far from the normal that the blood circulation is not adequate to life even in important parts of the body. When external hemorrhage occurs, it is balanced at the beginning by a liberal flow of blood from the liver, the spleen, and the large arteries, and by the contractions of the superficial vessels of the skin, but when it extends beyond a certain limit and prevents a sufficient blood supply from the arteries to reach the heart then shock is the result. If shock is threatened or already present, everything should be avoided that could possibly influence the circulation of the blood unfavorably, such as narcosis, operation, reduction or elevation of the body temperature, and psychic trauma. Shock depends upon a disturbance of the normal relationship between the caliber of the blood vessels and the amount of blood, the latter may be too sparse, the former too large. The treatment should be either the use of agencies that diminish the caliber of the blood vessels (adrenalin, ephedrine, coramine) or, in the second case, measures which increase the amount of blood (the intravenous injections of fluids or blood transfusion). There are five groups of shock-producing causes which govern the treatment of patients: (1) massive external or internal hemorrhage, or delayed hemorrhage, (2) severe injuries (traumatic shock), (3) septic conditions (after wound infections), (4) peritoneal inflammations, and (5) burns, e.g., of the skin or by gases.

According to Cannon, the experiences during the World War showed that the products of disintegration of the albuminous elements in macerated parts of the body caused traumatic shock by intoxication, as when an Esmarch bandage was removed from a macerated limb. The American surgeon, Blalock, claims that traumatic shock is caused by the loss of blood and fluids from the macerated tissues of a limb and is similar to hemorrhagic shock. Some authorities claim a reflex origin of shock (neurogenic

shock) When shock occurs late in a disease the tin content of the blood must be considered as cause.

The most important preventive measures against shock are blood transfusion and the infusion of fluids into the blood vessels. The blood transfusion has the advantage that not only fluids and salts, but also hemoglobin, albumin, and hormones are supplied and that their benefits are relatively more enduring than those of infusion of physiological sodium-chloride solution. The latter substance has the advantage of being more simply and easily administered in larger amounts—this is especially important in infectious conditions (wounds) when the drop-method can be employed. The drop-method is very effective in mammary and abdominal surgery also on the battlefield. The infusion can, in a large measure, replace the transfusion; the latter should never be done in hopeless cases (Rietz). The Swedish methods employed in the war are the storage of sterile physiological salt solution in Vichy water bottles eventually calcium, potassium, and sulfur may be added. Necessary apparatus for the drop-method and for percutaneous infusion should always be at hand. Blood transfusion is given according to the method of Jeschman or direct from donor to recipient. As safeguard against coagulation citrate (30 c.c.m. of 1 per cent solution in 300 c.c.m. of blood) is employed. Heparin to replace citrate is recommended by the state but its value is too little proved to be adopted.

These treatments may be given in the main first aid station or in the sectional hospital. As a donor, lightly wounded soldier may be accepted (only exceptionally member of the nursing staff). At temperature of 4 C the blood may be stored for three weeks and it will be chemically and biologically as valuable as fresh blood. As a rule blood should not be stored longer than one week. If slight hemolysis has occurred the blood should not be transfused. In the World War practically no blood was used except that obtained directly from the donor. In the Spanish War especially on the Republican side, stored blood was used. A large laboratory in Madrid furnished enough blood, stored for one year for 9,000 transfusions. In the Russian Finnish War also, large number of bloodbanks (blood stored in bottles) was utilized. The preserved blood must be kept cool. In Spain the transportation and storage of blood were well regulated; refrigeration was (ice boxes and meat autos) were used. The best method was employed in Sweden the blood was drawn from the donor into ordinary Vichy water bottles which are stored in cool places. The transfusion is given with metal tubes.

The question of blood grouping may be solved as follows:

The grouping is done by testing the serum immediately before the transfusion.

Blood grouping during peace times can be done for draftees and recorded. In the war this is an identification tag.

3. None but universal donors should be accepted for them the grouping of the recipients is not necessary. If wounded soldiers are taken as donors they must be grouped. In the literature there are reports of complications arising from too great a content of agglutinin in the plasma of the donor, which influenced the blood corpuscles of the recipient despite the dilution many succumbed. On account of similar occurrences, especially in brood patients, the three adjectives using the universal donor method, with biological tests in each case. This has the advantage that supply of only one blood group need be stored.

A sufficient number of universal donors can undoubtedly be found during peace times but only in proper organization. Blood from a dead body should be used (Russian method).

Notwithstanding simplified technique transfusion is somewhat difficult because of certain precautions in the blood bank distribution. It is much simpler to prepare for storage a large amount of sterile salt solution (this is easy to make and may be stored for a long time).

Regarding the means of combating shock, the various hospitals, as well as first aid stations should have at hand morphine, epinephrine and veratol, as well as means for supplying heat. The main first aid station should be furnished with a liberal supply of normal salt solution for infusions and for arrangements for giving blood transfusions. In the sectional hospital the question arises whether intravenous infusions of fluids or blood transfusions should be given to the wounded soldier. While the patient in shock should not be subjected to surgery his condition may demand the immediate operation of extensive wounds or amputation and therefore preoperative infusions or transfusions resorted to in clinical practice. Then the problem of postoperative treatment with intravenous infusions of fluids must be solved and for this the drop-method apparatus should be provided whenever possible.

(RACHNER) MATTHEW J. SEIBERT M.D.

Tantari, G. A., and Banfi, R. F. Studies on Prothrombin Adsorption of Prothrombin. Calculation of Concentration (Estudios sobre prothrombina Adsorción de la prothrombina. Cálculo de la concentración). *Seminario médico* p. 47, 48.

In previous articles the authors have discussed the technique for determining the concentration of prothrombin in the blood plasma of human beings and rabbit. In this article they discuss the adsorption of prothrombin and the calculation of its concentration. Details of the chemical technique and tables also giving the results are given.

The best pH for the coagulation of blood is between pH 6 and pH 8. Rabbits of different races and coming from different places show varying thromboplastin content in the brain powder obtained from them. This variation and the method of preserving the brain powder important factor is in the activity of the thromboplastin emulsion. The author be-

heves that the length of time between the death and the decerebration of the animal also has an effect

Prothrombin is adsorbed by many substances The author found barium sulfate most effective

In calculation of the concentration, the plasma to be examined is diluted with plasma from which the prothrombin has been removed The concentration of prothrombin is calculated by determining the coagulation time of different dilutions of plasma

AUDREY G. MORGAN, M.D.

Mogensen, E. Three Cases of Simmonds' Syndrome *Acta med Scand*, 1940, 105 378

The author reports 3 cases of Simmonds' syndrome which are summarized as follows

CASE 1 The patient was a man thirty-nine years of age Ten years before treatment he had, following a febrile disease, developed the following symptoms: loss of weight, asthenia, atrophy of the external genital organs, impotency, loss of hair, and changes in the skin Examination further showed decrease in the basal metabolic rate, anemia, hypotension, and a tendency toward hypoglycemia and hypothermia, x-ray examination of the sella turcica showed a slight dilatation, examination of the eyes revealed bitemporal quadrant hemianopsia to a colored object, and estimation of hormones revealed a pronounced decrease in the figures for gonadotropic and testicular hormone

Under intense treatment with gonadotropic hormone from the urine of pregnant women (physex leo) a very striking improvement took place The patient gained 12 kgm in weight, the growth of hair and the sexual function became normal, the basal metabolic rate and blood-pressure likewise became normal During a period of observation of two years he has felt perfectly well under a maintenance treatment with physex

CASE 2 A man fifty-five years of age had developed the following symptoms over a period between ten and fifteen years: loss of weight (20 kgm in all), pronounced debility, genital atrophy, impotency, loss of hair, and changes in the skin Examination revealed a low basal metabolic rate, achlorhydria, and anemia, x-ray examination showed a considerable dilatation of the sella turcica, examination of the eyes revealed bitemporal hemiachromatopsia, and an estimation of the hormones in the urine showed much reduced values for gonadotropic and testicular hormones

Treatment with gonadotropic hormones (physex leo) caused a very marked improvement of the patient's physical and mental condition, so that he was again able to attend his work, his hair also became thicker, and there was some development of the genital organs The sexual functions were not restored The improvement obtained has lasted three and one half years under continued treatment with physex

CASE 3 The patient was a woman of forty eight years of age, in whom the menopause had occurred at the age of twenty-six, at the same time she lost

the hair of her axillae and pubes During the following years there was a great loss in weight, about 25 kgm in all Examination showed premature senility, emaciation, pronounced atrophy of the genital organs, changes in the skin, reduced basal metabolic rate, anemia, and low blood-sugar values with severe hypoglycemic attacks Hormone determinations showed strongly reduced values for gonadotropic hormone and estrin X-ray examination of the sella turcica and ophthalmological examination did not reveal any abnormalities

By the administration of frequent meals to the patient it was possible to keep her free of pronounced hypoglycemic symptoms Treatment with an alkaline extraction of the anterior lobe of the pituitary gland caused some rise in the blood-sugar values, but the effect was not constant enough to make possible an effective treatment

Treatment with gonadotropic hormone was unable to improve the condition Treatment with estrin was accompanied by fair improvement The patient, who at the time of admission was cachectic, was discharged in a relatively good condition, which has lasted during an observation period of more than two years During this period she put on 6½ kgm of weight

The cause of the syndrome was most clear in Case 2 The author believes that presumably he was dealing with a chromophobe adenoma of not a small size, as the sella turcica was considerably dilated and there was a bitemporal constriction of the visual field Cases of Simmonds' syndrome caused by chromophobe adenomas have been described in the literature The insufficiency of the anterior lobe of the pituitary gland may be explained by an adenoma of the endocrinely inactive cells which displaces or compresses the endocrinely active chromophil cells

In Case 1 the pathological substratum was more uncertain The disease manifested itself following a highly febrile infectious affection which may possibly have caused vascular disorders of the pituitary gland, followed by necrosis, other possible explanations of the sudden onset might be disease of the meninges with a secondary fibrous process, or hemorrhage in a preexisting pituitary tumor The roentgenological and ophthalmological changes speak in favor of a tumor, most likely a chromophobe adenoma as in Case 2, but of a far smaller size

In the third patient there were no signs of tumor of the pituitary gland or its surroundings, this case represents Simmonds' syndrome in the strictest sense It goes without saying that it can only be guessed that this case presented the sequel of a post-partum necrosis of the anterior lobe of the pituitary gland, as did the first case described by Simmonds

SAMUEL H. KLEIN, M.D.

Mogensen, E. Simmonds' Syndrome *Acta med Scand*, 1940, 105 360

A description is given of Simmonds' disease, or—a better name—Simmonds' syndrome This con-

dilation is defined as chronic, progressive affection, due to failure of the endocrine function of the anterior lobe of the pituitary gland, and is characterized by the deficiency symptoms produced thereby.

The syndrome arises as the result of different pathological processes in the pituitary gland or its vicinity. The most important clinical symptoms are loss of weight, asthenia, atrophy of the genital organs (with decreased sexual function in females), amenorrhea, (in males) impotence, loss of the axillary and pubic hairs. In males loss also of the beard, changes in the skin and decreased basal metabolic rate. Less consistent symptoms are hypotonia, hypothermia, bradycardia, hypoglycemia, gastrointestinal disorders, anemia, and achlorhydria. It is emphasized that cachexia is a late phase in the development of the disease and by no means a necessary symptom without which the diagnosis is not possible. The differential diagnosis, particularly from anorexia nervosa, is discussed. It is pointed out that a large number of the cases which have been published as being Simmonds' disease must be interpreted as cases of anorexia nervosa. This fact is very important as far as evaluation of therapy is concerned, particularly the therapy which consists in implanting pituitary grafts.

Treatment with gonadotropic hormones of sufficient effectivity and in sufficiently large doses is the most promising. By this treatment it may be possible to produce striking improvement in the general condition and to counteract the most important deficiency symptoms in Simmonds' syndrome.

SURGER: H. KLUCEK, M.D.

Moersch, F. P., Lova, J. G., and Kermohan, J. W.
Melanoma. *J. Am. Med. Ass.* 1949, 3, 48.

In the ten-year period from 1930 to 1939, inclusive, the authors saw approximately 500 patients who had melanoma. This number represents about 1 per cent of the total number of patients suffering from malignant lesions seen during that period. Unfortunately complete follow-up study in the 500 cases was not possible; therefore, accurate deductions could not be made. In approximately 1/4 of the cases of melanoma the primary tumor, as situated in or about the eye and in at least 34% of the 500 cases there was evidence of local recurrence or metastasis. At the time the patients were last seen at the clinic. The majority of the patients died. In at least 34, or 1/3 per cent, of the 347 cases there was clinical evidence of melanotic involvement of the central nervous system.

In 4 cases the brain was the site of the melanotic involvement. In 1 case the spinal cord was affected. In 1 instance both the brain and spinal cord were affected. In 9 of the 34 cases the diagnosis was verified by microscopic examination of specimens removed from the brain or spinal cord, operation, or by necropsy. In the remaining 5 cases, necropsy was not performed or did not include examination of the central nervous system. Twenty-four additional cases in which there was no post-

mortem or operative confirmation were excluded, but the authors called attention to this additional group because in study of this type one cannot fail to be impressed by the fact that metastatic involvement of the central nervous system by melanoma is much more common than is generally appreciated.

Failure to appreciate the importance of melanotic involvement of the central nervous system could be due to several factors. Following a diagnosis of melanoma, with evidence of metastases, the patient is frequently taken home and dies without a post-mortem examination. Again, in the absence of primary melanoma of the skin or in some other obvious site, patient may die without proper diagnosis and the correct diagnosis may be established only by necropsy, which is performed only occasionally (Mewes). The very late occurrence of metastasis from primary melanoma may also lead to an incorrect diagnosis.

Of the 34 patients, 3 were males and 31 were females. Operation was performed in 11 cases in 6 for tumor of the brain and in 5 for tumor of the spinal cord. It is noteworthy that in 2 cases the presence of a melanoma was not suspected prior to operation or necropsy. In 8 of the cases no primary melanoma was discovered. In 3 cases, after the melanoma in the nervous system was found, the patient or family revealed the fact that a mole had been removed previously. In the remaining case the eye had been enucleated some time previously. A diagnosis of glaucoma had been made but because of the subsequent course of events the eye undoubtedly must be considered as the site of primary melanoma.

The ages of the patients at the time of examination at the clinic because of symptoms referable to the central nervous system ranged from four years to sixty-six years. The length of time from the existence of the primary melanoma or mole to the death of the patient varied from four months to thirteen years. The average duration, as approximately two and half years. The authors said that it is pertinent to this problem to insist that moles situated in places subject to irritation should be excised before they show any signs of "wideness." The site of the known primary mole, as as follows: back, in 1 case; head, face, and neck in 5 cases; eyes in 6 cases; heel in 3 cases; hand in 1 case; umbilicus in 1 case; labium in 1 case; and unknown in 8 cases. The length of time the mole was present before removal varied from one to thirty-eight years. In a few instances the patient stated that the mole had always been present. As a rule some fourteen months had elapsed between the removal of the cutaneous mole and the first signs of metastasis.

In only 6 of the 34 cases in our series, as there was metastatic involvement of both the brain and spinal cord. In 3 cases the melanoma appeared to be primary in the brain and in 3 cases it appeared to be primary in the spinal cord. In these 6 cases operation was performed and the diagnosis was made by biopsy.

In 11 of the 24 cases of melanoma of the brain the outstanding clinical symptoms, such as mental dullness, confusion, coma, and delirium, pointed to involvement of the brain. In 2 cases the clinical picture was confused by the presence of a bromide psychosis or drug intoxication. Several of the patients were moribund when they were brought to the hospital and the correct diagnosis was made only at necropsy. The cerebrospinal fluid was examined in 3 cases of melanoma of the brain. In 2 cases the fluid was entirely normal. In the remaining case the value for the total protein was 50 mgm per 100 cc of fluid and there were 67 lymphocytes in each cubic centimeter of fluid. In no instance was melanin discovered in the spinal fluid.

Roentgenographic examination of the skull was of little value in the diagnosis of melanoma of the brain. In 5 instances roentgenographic examination of the thorax showed evidence of metastatic involvement and in 2 additional cases the results of such examination were suggestive of metastatic involvement. Loss of weight was a common symptom. In 5 cases the sedimentation rates of the erythrocytes were 10 mm, 18 mm, 24 mm, 64 mm, and 100 mm at the end of one hour, respectively. In only 1 instance was melanin discovered in the urine, but tests for melanin in the urine were not carried out routinely in this series of cases.

The authors declared that it was evident from a survey of their post mortem material that metastatic melanoma may occur throughout the organs of the body without involvement of the central nervous system, and similarly, though to a lesser degree, the brain or spinal cord may be the only site of metastatic involvement.

In the differential diagnosis of melanoma, they wrote, it must be remembered that the patient or relatives frequently will fail to mention the previous removal of a mole. As a rule, such information is withheld unintentionally but in a few cases in their series the knowledge of a mole was deliberately withheld because of the previous unfavorable prognosis.

The authors believed that little can be accomplished by operation in cases of melanoma of the central nervous system, but also that a defeatist attitude in regard to this serious affliction should not be adopted. They said that in a small percentage of cases a great deal of palliative relief, even if not actual cure, can be obtained by radical operation. If the melanoma is primary in a so called silent area of the brain, radical surgical removal may be justified, if the lesion is single and nodular, even though metastatic, complete removal may be possible. If the lesion cannot be extirpated from the brain, palliative subtemporal decompression may afford relief from the increased intracranial pressure and its consequent headache, vomiting, and failing vision.

If the melanoma is intraspinal and does not invade the spinal medulla, complete removal is possible. Even if it involves one or more nerve roots, these might be sacrificed in a radical surgical procedure

without endangering the patient's life. If the spinal cord or intraspinal nerve roots are involved by a neoplasm and if the tumor is not too extensive, subtotal removal is not only justifiable but definitely indicated to ameliorate the patient's symptoms.

These tumors spread either by blood stream or by lymphatic pathways or, usually, by both, the original tumors have a tendency to invade blood spaces early and this explains their wide dissemination throughout the body. It is difficult to understand why in some cases there may be a latent period of many years between the excision of the original tumor and the appearance of the secondary masses. This late recurrence of metastasis is misleading and disconcerting to all concerned in dealing with the problem.

The authors concluded that melanoma of the central nervous system is a diagnosis that must be reckoned with by the neurologist, that careful inquiry about the removal of pigmented lesions should be carried out, and, if possible, any available material should be reexamined for the presence of melanoma. It must be realized that a melanoma occasionally may be primary in the central nervous system, and that in the presence of any rapidly progressive lesion of the central nervous system such a diagnosis must be seriously considered. Although it is not in the realm of the neurologist to advise patients regarding lesions of the skin, the opportunity of preaching prophylaxis in the presence of pigmented moles must not be overlooked.

DUCTLESS GLANDS

Mussio-Fournier, J. C., and Albrieux, A. A Contribution to the Study of the Absorption of the Sex Hormones by the Skin (Contribution à l'étude de l'absorption des hormones sexuelles par la peau). *Presse méd*, Par, 1940, 48: 569.

Mussio Fournier and Albrieux and their associates have demonstrated by animal experiments that folliculin is absorbed through the skin, other investigators have reported similar findings. In 1935, one of the authors (Mussio-Fournier) and his collaborators were the first to use the cutaneous route for the treatment of cases of facial hypertrichosis and acne. Sixty per cent of the cases of facial hypertrichosis were cured by the local hormone treatment, and favorable results were obtained in 3 of 7 cases of acne, acne is not always due, the authors note, to ovarian hypofunction. Good results have also been obtained in the treatment of vulvar pruritus and kraurosis by the local application of an ointment containing 250,000 international units of estradiol benzoate per 60 gm. In facial hypertrichosis and acne, the absorption of folliculin by the skin is shown by the fact that general symptoms were relieved as well as the local lesions.

However, the hormone evidently has a local action also, this was shown in a case of facial hypertrichosis in a woman twenty three years of age to whom estradiol dipropionate and later progynon B

were given in oily solution by intradermal injection. The injections were given at first only on one side of the face and the depilation was much more marked on the treated than on the untreated side. This patient showed other symptoms of ovarian hypofunction, including amenorrhea and determination of the folliculin hormone content of her blood showed it to be definitely below normal.

Animal experiments carried out by the authors and their associates have shown that the male hormone also is absorbed by the skin. They have not used the male hormone clinically by local application, but others have reported good results with local application of testosterone in the form of an ointment.

ALICE M. MENDES.

Sprunt, D. H., and McDearman, S. The Relationship of Sex Hormones to Infection. *Endocrinology* 940, 7 893.

It has previously been shown that pregnancy pseudopregnancy and the estrogenic hormone modify the rabbit's response to virus infection and that there is a close relation between the spread of India ink in the skin and the rabbit's susceptibility to infection.

Experiments are described which show that wide variation in the spread of particulate matter in the skin occurs in so-called normal rabbits. However under controlled conditions, this spread can be reduced. The estrogenic hormone and pseudopregnancy significantly reduce this spread. The effect of castration is reduction of the spread, which later returns to normal, though the return to normal may take as long as six months.

A few experiments indicate that the male hormone does not affect the spread of India ink, but that the amount of spermatogenesis present in the adult male is closely related to the susceptibility of the animal to infection. The relationship of this spread to susceptibility to infection is shown to be close.

Further work is needed on the effect of dispersion and concentration of both bacteria and viruses. The information now available indicates that certain disease agents, such as vaccinia, are aided by anything that causes an increased spread in the skin. Other disease agents, such as moderately virulent staphylococci are inhibited by dispersion. The converse is also found to be true.

RUSSEL KARP, M.D.

INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 72

JUNE, 1941

NUMBER 6

PRINCIPLES OF SURGICAL PRACTICE

SAFETY FACTORS IN SURGERY OF THE BILIARY TRACT

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INTRODUCTION

SURGERY of the biliary tract has been largely developed in the twentieth century. With the perfection of roentgenographic diagnosis, the increasing knowledge of the physiology and pathological physiology of the biliary tract, and the number of laboratory aids, operations on the gall bladder and its ducts have become not only common but safer. Fortified with the added knowledge, surgeons undertake procedures of great magnitude today, for example, partial pancreaticoduodenectomy, as developed by Whipple (43).

However, one still hears of "liver deaths" and of the unreliability of certain tests heretofore considered dependable. There is still evidence that surgeons are not satisfied with the final results in biliary-tract disease. There is a desire to stress those factors which will make such surgery safer and more lastingly satisfactory to both physician and patient. Heuer (19), in a group of over 35,000 cases of biliary tract surgery collected from American and foreign literature, gives the following incidence of factors leading to death: gangrene and perforation 10 per cent, operative shock and peritonitis 33 per cent, pulmonary complications 20 per cent, cardiorenal complications 12 per cent, "liver deaths" 4 per cent, pancreatitis 2 per cent, miscellaneous or unknown causes 19 per cent.

With increasing experience, one is more and more impressed with the importance of (1) evaluation of the patient's status by complete clinical and laboratory studies, (2) definite indications for

or against operation, (3) the necessity of choosing the procedure best suited to the individual case, (4) the great value of pre-operative preparation, particularly in regard to improvement of liver function, and, finally, (5) the avoidance of injury to normal and/or anomalous ducts or vessels. Only by incessant attention to details can maximum success be assured.

GENERAL CONSIDERATIONS

The surgeon seldom sees the patient suffering from biliary ailments until the disease is well advanced. The physician, though he may have reason to suspect biliary-tract pathology, may wait until his patient has a recurrence or exacerbation of symptoms before recommending surgical opinion. The dangers of operation are greatly increased under these conditions. The liver will often be more or less damaged, although authorities disagree as to whether this liver damage is a cause, a result, or an integral part of the biliary-tract condition. One of the cardinal rules for safer surgery is to see the patient early in the disease.

The question of liver damage and the pre-operative preparation or rehabilitation is especially important. It is unwise to send a patient to the hospital one day and operate on him the next. This is true particularly if there be jaundice, dehydration, acidosis, toxemia, and disturbed liver function due to associated hepatitis.

Judd (26) states that biliary calculi in themselves have no effect on the prospect of cure, providing the acute or chronic process receives attention before complications arise. It is unknown whether or not the formation of biliary calculi is a factor in the production of malignancy, but the

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two conditions are associated often enough to justify recommending the prompt removal of biliary calculi when found. Calculi are frequently responsible for necrosis of the gall bladder or cystic duct, obstruction of the biliary channels, formation of abscess or fistula, and other serious complications.

The presence of jaundice increases the risk and difficulties of biliary surgery. Hobbey is quoted by Hoke (3) as pointing out that the chief dangers of operating upon jaundiced patients are hemorrhage, uremia, hepatic insufficiency and disturbance of the acid-base balance. He emphasizes the necessity of taking a careful history with reference to familial tendencies toward jaundice and hemorrhage. A careful physical examination will help avoid many pitfalls. Examination of the cardiovascular and respiratory systems and study of the fluid intake and output, as well as of the bleeding and coagulation time, are also useful and important. The icterus index and liver-function tests provide invaluable information.

Hoke states that in gall-bladder surgery unsatisfactory results occur at times because of poor judgment on the part of the surgeon as to the degree of the disease present, or as to the patient's ability to withstand the particular operation contemplated. The relatively frequent association of comparatively symptomless cholelithiasis with hepatitis and with malignancy of the gall bladder may justify cholecystectomy even in the absence of marked symptoms.

Boyd (5) made a study of the mortality risks incurred by patients undergoing gall-bladder surgery. Of 1,018 cases in which gall-bladder surgery was done at the Massachusetts Memorial Hospital of the Boston University School of Medicine 107 were fatal. From the study of these 107 cases Boyd concluded:

The procedures of cholecystectomy and cholecystostomy must still be considered serious operations, with potentialities for high mortality rate. Appendectomy does at the same time is unlikely to increase the operative risk if the cases are properly selected. Gall bladder operations combined with any other major procedure carry too great a hazard to justify them except in distinct emergencies. In cases presenting multiple surgical diseases, stage operation should be done, the more urgent conditions being treated at the first operation, and the less urgent conditions in one or more operations later.

Women are better operative risks than men. In this series there was a higher incidence of operations and lower mortality rate among females. Gall bladder surgery in those over 60 carries a mortality rate of from 5 to 40 per cent, increasing with age. In this age group particularly the severity of symptoms must be weighed carefully before incurring the risks of surgery. Elective operations must be deferred until the patient's general condition has been brought to its optimum.

By executing the following steps the mortality rate is lowered from 10 per cent in 1914 to 6.4 per cent in 1915.

The indications for operation must be specific: stones and history of colic or of extra hepatic jaundice are the more important. A clinical history of colic plus positive cholecystograms is also an indication. The operative procedures must be simple, gentle and not unduly prolonged.

Coile (8) emphasizes that if certain relationships exist between the choledochus, the duct of Wirsung and the papilla of Vater, both ducts may be converted into a single continuous channel by obstruction of the papilla. Once a channel has been established, bile may flow into the duct of Wirsung, or pancreatic juice may find its way into the choledochus. The varying intraductal pressure is probably the factor which determines the direction of the flow. Reflux of pancreatic juice into the biliary system probably has no appreciable clinical result, but pancreatic ferment sufficiently concentrated in gall-bladder bile to change its usual acid reaction to alkaline may enable the bile salts to act destructively on the wall of the gall bladder, and the activated pancreatic ferment may have a similar action on the wall. As a result of the chemical inflammation caused by these various factors, either an acute cholecystitis or non-perforative peritonitis may occur.

Modern accuracy in the diagnosis of biliary tract disease and well defined therapy leave little excuse at present for removing the gall bladder as a routine measure. It is likewise inadvisable to delay operation until the inflammatory or obstructive fact has extended beyond the original site into the ducts, liver and pancreas, so that when surgery is unavoidable it will carry with it a high mortality and morbidity (Whipple 4). In presenting his views on therapy Whipple emphasizes three factors which enter into the pathogenesis of all cases of biliary tract disease requiring surgical intervention: (1) gall-stone formation, the result of disturbed metabolism; (2) infection; and (3) obstruction. Single or in combination, these three are always present and the part of the biliary tract where they are active determines the symptoms and physical signs. Understanding of these factors and their presence in the gall bladder or ducts makes the pathology, symptomatology, diagnosis, and treatment of the disease rational, interesting and accurate.

If the signs of acute cholecystitis do not subside within from twenty-four to forty-eight hours under a regime of rest in bed, nothing should be given by mouth except hot water and tea and an ace-bug should be applied to the right upper quadrant. Then the gall bladder should be removed or drained. To operate on a acute cholecystitis may

be regarded as radical by many but it is Whipple's opinion that the relatively high mortality in his series of cases was due to the earlier policy of delaying surgery until an empyema or cholangitis had made operation imperative. For the chronic cases operation may be delayed while the patient subsists on a diet which excludes foods rich in lipoids and nucleoprotein with a high cholesterol content. He must be cautioned against over-fatigue. However, if there be strong evidence of stone formation or cholesterosis, then cholecystectomy carries only a low risk, with permanent cure in most of the cases if it is done while the lesion is still limited to the gall bladder.

DIAGNOSTIC PROBLEMS IN BILIARY SURGERY

A correct diagnosis is always of paramount importance in the prognosis and may indicate special features in the pre-operative, operative, and postoperative management. Meyer and Steigmann (30) in discussing the differential diagnosis of stone or benign stricture as against malignancy of the gall bladder, common duct, hepatic duct, or pancreas, or metastatic malignancy (peritportal glands, stomach, ovary), give this table¹

TABLE I—DIAGNOSIS OF BENIGN VS MALIGNANT BILIARY TRACT DISEASE

Finding	Malignant group per cent	Benign group per cent
(62 "surgical jaundice cases")		
1 General appearance	apathetic	alert and complaining
2 History of sepsis (fever and chills)	3	32
3 Enlarged liver	82	68
4 Icterus	slowly mounting on high level	variable
5 Icterus index over 100	75	21
6 Loss of weight	65	18
7 No urobilin in urine	76	7
8 Acholic stools	76	7
9 Direct Van den Bergh positive	83	21
10 Low galactose excretion in urine, less than 3 gm more than 3 gm	92	80
11 Ascending or maintained sugar tolerance curve	16	48
12 Morphine required for pain	73	25
13 Pruritus	0	50
14 Plasma cholesterol ² above 200 mgm/100 c cm	41	21
170-200 mgm/100 c cm	53	50
c cm	30	8

¹Modified by the author

²Lower values are obtained in hepatitis jaundice

Character of jaundice: the jaundice in malignancy tends toward greenish yellow, in hepatitis (severe) toward reddish brown

Jacobi (24) aptly points out that the difficulties in clinical studies of jaundice are usually due to lack of appreciation of the underlying mechanisms. Jaundice, for clinical purposes, is divided into (1) retention jaundice and (2) resorptive (regurgitative) jaundice.

Retention jaundice indicates an increase in the circulating bilirubin from causes other than obstruction of the common duct or intrinsic lesions of the liver. Retention jaundice is classified as follows:

1 Jaundice associated with hemolysis of the red blood cells (a) hemolytic jaundice, (b) pernicious anemia, (c) splenomegalic hemolytic anemia, (d) sickle-cell anemia, (e) acute infectious disease associated with increased red blood-cell destruction, (f) icterus neonatorum, (g) infarction, and (h) Weil's disease.

2 Jaundice associated with an anoxemia of the liver cells (a) cardiac decompensation, (b) toxic hepatitis resulting from the toxic action of such drugs as arsphenamine, chloroform, and phosphorus, or from hematogenous infections, and (c) anoxemia due to the occurrence of pulmonary infarctions.

In retention jaundice an increased amount of bilirubin is being brought to the liver cells which cannot excrete it all because of the increased amount and/or damage to the liver cells. Briefly the laboratory findings in this type of jaundice are:

1 This type (hemolytic) of bilirubin³ is bound to plasma proteins and does *not* appear in the urine.

2 The bile salts do *not* appear in the urine.

3 Urobilin *does* appear in the urine.

4 Urobilin is increased in the feces.

5 The Van den Bergh reaction is either indirect, delayed direct, or both (combined).

Resorptive jaundice. In resorptive jaundice (regurgitant jaundice) the bile is excreted by the liver cells but it succeeds in reentering the blood vessels of the liver and thence gets into the blood stream. Under this heading may be included the following types of cases:

1 Obstructive jaundice (a) calculus in common duct or ampulla of Vater, (b) stricture of the common duct, (c) marked suppuration of the common duct, (d) carcinoma of the common duct, and (e) extrinsic pressure from glands, scar tissue, or carcinoma of the head of the pancreas.

2 Intrinsic hepatic disease (a) cirrhosis of the liver, (b) carcinomatous involvement of the liver, and (c) abscess of the liver.

3 Toxic liver damage.

³1-10,000 concentration in the blood is the threshold for kidney excretion.

Briefly the clinical and laboratory features in reabsorptive or regurgitation jaundice are

1. Pruritus.
2. The bilirubin¹ and bile salts quickly appear in the urine.
3. Urobilin in the urine and feces is decreased or absent.
4. The Van den Bergh reaction is the immediate direct.
5. In complete obstruction clay-color stools persist.

However in toxic or hemolytic jaundice an element of obstruction with rupture of the bile canalculus can be superimposed which gives a combined lesion which constitutes a clinical snag preventing diagnostic differentiation into obstructive and non-obstructive forms. Moreover the various liver-function tests only indicate a degree of functional impairment and do not differentiate obstruction from non-obstruction.

1. *Bromsulphalein test* Intravenous administration of bromsulphalein should normally yield no dye in the blood stream at the end of half an hour; the test is valuable in toxic forms of jaundice. In cirrhosis and carcinoma the results are variable.

2. *Levulose test* Levulose by mouth is normally rapidly stored in the liver. 40 gm. of levulose are fed by mouth and the blood sugar is noted for several hours. In diffuse liver damage the blood-sugar curve is very high with the peak at one hour and a half.

3. *Galactose test* Forty grams of galactose by mouth should yield a spill no greater than 1 gm. into the urine and the blood-sugar rise should be no greater than 30 mgm.

4. *Hippuric-acid test* (Quick) Six and nine-tenths grams of benzoic acid by mouth should be conjugated by the liver so that a minimum yield of 3 gm appears in the rise in the prescribed time: four hours, as hippuric acid.

5. *Fibrinogen test* (Gell) Plasma or serum fibrinogen values of $\frac{1}{2}$ per cent or less indicate hepatic disease: acute yellow atrophy, cirrhosis, or extensive liver metastases. In the presence of jaundice values over $\frac{1}{2}$ per cent indicate disturbance of the biliary tract, stasis, and possible lithiasis.

6. *Dextrose-tolerance test* Jacobl found that 100 gm. of glucose administered by mouth in a case of jaundice which gave a return of blood sugar to normal at the end of two hours indicated a toxic jaundice in which operation was of no use and contraindicated; should the blood sugar fail to return to normal at the two-hour period, stricture, suppurative, calculus, or carcinoma of the head of

the pancreas are to be suspected: this is the so-called obstructive type of sugar tolerance curve. However, intrinsic liver disease gives the same curve (cirrhosis, carcinoma, or abscess of the liver). To differentiate benign cirrhosis of the liver or mild toxic hepatitis from the other conditions, the patient should be fed 50 gm. of glucose daily and receive 10 units of insulin twice a day and an ampule of liver extract daily (Vitamin-B deficiency). With this regimen for two or three weeks cirrhosis or mildly toxic cases clear; failure to clear indicates cholelithiasis, carcinoma of the common duct, carcinoma of the head of the pancreas, or other obstructive condition.

7. *Stercobilin-tolerance test* (Watson, 41) Fifty milligrams of crystalline stercobilin given intravenously (urobilin) should be destroyed by the liver. In hepatic dysfunction 25 mgm. or more are excreted by the kidney into the urine (lowered stercobilin tolerance).

While jaundice is an indicator of disease of the liver or biliary tract, its absence does not rule out serious organic disease. Thus, Chaikin (7) has recently reported a case of carcinoma of the head of the pancreas with metastases to the liver without jaundice and quotes the following incidence of jaundice in carcinoma of the head of the pancreas:

Masser	4 per cent—90 cases
Easterman	46 per cent—43 cases
Friedenwald	78 per cent—37 cases

According to Meyer and Steigmann, the jaundiced patient requires a thorough physical examination which should include a search for possible lymph-node metastases, scars from previous operations, masses in the abdomen, rectum, or pelvis, and a determination of the size of the liver, spleen, gall bladder and kidney. Cases that give persistent negative urobilin tests in the stool and urine from ten to fourteen consecutive days are strongly suggestive of a surgical jaundice of the malignant type. The author has reason to believe that in the presence of jaundice the liver does not excrete the dye used in the Graham-Cole tests, so that this test, at least as done at present, is almost useless. This opinion is based on experimental findings of the junior author and is in accordance with the findings of numerous other workers in this field. The laboratory tests must be done accurately; they must be correctly evaluated and they must not be regarded as pathognomonic. It is in the evaluation of all the data obtained that one clinical judgment is of importance. A single type of icterus is the sole problem in any case.

¹20-250 concentration in the blood. The threshold for kidney excretion.

Surgery appears to be indicated in jaundiced patients who present themselves with an icterus of variable or increasing intensity, especially if associated with a greenish hue, pruritus, and dermatitis, who give a history suggestive of a previous biliary or gastro-intestinal disease, who are in late middle life or older, and who have had no exposure to hepatotoxic substances or a systemic disease. The indication is especially clear when these patients have an enlarged liver, a palpable gall bladder, other palpable abdominal masses, palpable lymph glands, loss of weight, and absence of a palpable spleen.

The importance of early recognition of surgical jaundice is demonstrated by the fact that many patients who have biliary colic and intermittent attacks of slight icterus go on to severe liver damage if relief is not obtained through surgery. Given the diagnostic data considered, the authors do not hesitate to advise surgical relief of the jaundice after careful pre-operative preparation of the patient.

Age of patient Gall-bladder disease is usually looked upon as a disease associated with obesity and middle life, the period when affections of the heart, the vascular system, and the kidneys are most likely to make their appearance. Whether these degenerative diseases exist quite apart from the pathological condition in the biliary tract, or whether they are all part and parcel of a state due to one underlying cause is difficult to estimate. The coexistence of cardiovascular and renal disease greatly increases the danger of surgical intervention upon the biliary tract, and it is only by dealing appropriately with these complications that we can hope to make biliary surgery safer.

By no means is gall-bladder surgery done only upon those of middle age. Many persons are well advanced in years and these elderly patients present problems which do not crop up with younger subjects. Boyce (4) notes especially that all upper abdominal surgery is likely to be complicated by respiratory-tract disturbances, particularly in middle and later life, biliary surgery being no exception. To this must be added the risks of hemorrhage, shock, and infection. Yet, with proper precautions, even the aged and enfeebled can be carried through safely, as many operators have testified.

Judd has stated that many of the patients seen at the Mayo Clinic have been between seventy and eighty years of age, "but even under these circumstances, careful pre-operative preparation often will enable an aged and extremely debilitated person to tolerate the extensive operation

that usually is required." He cites the case of a woman of seventy-four who had lost 50 lb in weight, yet recovered perfectly from "cholecystectomy, choledocholithotomy and choledochostomy" performed at a single session. Babcock says that though the third stage of complicated biliary disease usually manifests itself after the age of forty-five years, the complication may occur in those under the age of twenty, "as in a case in which we found cholecystitis with over 300 gall stones, associated with an acute pancreatitis in a girl of 13 years." The records show, in fact, that patients operated upon at the extremes of life, on the whole, do better than those who are in the classic "gall-stone period."

Stage of the disease In general, the earlier the operation is performed the better will be the patient's chance of recovery and complete cure. If the gall bladder is merely infected even when stones are present, the case presents a fairly simple surgical problem. However, if the condition has already progressed to the stage of obstructive jaundice, or a secondary inflammation has been set up in the pancreas, the risks are enormously increased. However, the difficulties which stand in the way of getting patients promptly to the surgeon usually prevent the safety factor of early operation from being introduced. The operator must then decide how he can best deal with the disease in the stage in which he first sees it and this is seldom an easy decision to make. Careful estimation of the patient's ability to withstand operation is of utmost importance and a sufficient number of pertinent tests of functional ability of the organs likely to be affected is indicated.

In the experience of Walters (39, 40) and his coworkers, the presence of jaundice causes a rise in the operative mortality rate, for it indicates biliary obstruction with its associated infection within the liver and the resulting disturbances of hepatic function. Generally, such complications could have been avoided if the diseased gall bladder has been removed before it discharged its stones into the common bile duct. Cholecystectomy, if performed early, would prevent the benign biliary obstruction due to inflammatory edema in the head of the pancreas and cholangitis, in almost all cases the results of failure to remove the infected gall bladder.

Patients with intermittent hepatic fever due to choledocholithiasis may have to be operated on during the febrile stage in order to relieve biliary obstruction and to establish drainage at the earliest possible time and thus avoid hepatic damage. Recovery in some cases has been ma-

terially aided by the administration of oxygen subsequent to operation.

Evaluation of laboratory aids. It is Lahey's (27-28) opinion that no test of biliary function can be relied upon except in careful correlation with the clinical findings, an opinion which he has founded upon an exceptionally wide experience in the management of biliary tract disease. While the Graham test is a valuable diagnostic procedure in the detection of biliary disease it is correct only in from 80 to 90 per cent of the cases. If Lahey finds the Graham test by mouth uncertain when correlated with the previous clinical findings, he repeats it using the intravenous technique. However, he does not give intravenous tests to "patients who have angina pectoris, to patients who have any serious cardiac lesions, to patients who are badly emaciated or in bad condition, nor to those who are jaundiced or whose gall bladders are in the acute stage of inflammation. This is because the introduction of the dye into the blood stream in the presence of an acutely infected gall bladder may make it an acute gall bladder requiring immediate operation.

Lahey "would not consider operating on a patient merely because his gall bladder did not fill or empty if he had no clinical evidence of gall bladder disease. Neither would he 'hesitate to operate upon a patient for gall stones if he had typical gall-stone colic and his gall bladder emptied and filled normally as will occasionally be the case. He believes very strongly that "when the clinical evidence of gall bladder disease correlates with the x-ray findings after administration of the dye, then it becomes of great value and it adds to one's feeling of security in advocating surgery for probable gall bladder pathology. It is much safer in his opinion, when presented with a case of acute cholecystitis, to "temporize by doing a preliminary cholecystectomy and reserving cholecystectomy for a later date. However, in order to save the patient from undergoing two operations, he endeavors to take him through the acute cholecystitis, if the progress of the case is satisfactory until the time when the complete removal of the gall bladder can be safely done.

Although such a course increases the safety in certain conditions, it requires the best surgical judgment to decide when it is safe to follow it. Only when the previously high temperature has begun to fall, the tenderness tending toward localization, spasm is disappearing and the general reaction is favorable is it safe to wait. If on the other hand, tenderness persists, temperature remains high, the white blood-cell count shows no

decrease, or no general improvement is discernible preliminary drainage with cholecystectomy at the end of one or two months is the only safe course.

In the discussion of safety factors in gall-stone operations, Graham (17) himself has said that the study of certain cases in which death followed a relatively simple cholecystectomy showed that in every instance there had been an abnormally high retention of the dye when his test had been applied pre-operatively. The deaths occurred in patients who had apparently been good risks for operation, and at autopsy no cause for death other than a badly damaged liver was in evidence. In reviewing the entire case history he found that in every instance there had been a high retention of the dye. "Whereas in the normal individual there is a retention of from 10 to 15 per cent of the dye within a half hour, of these four cases just mentioned two had retentions of 90 per cent, in the half hour one of 70 per cent and the fourth of 60 per cent. In view of the striking relationship between a high retention of the dye and the danger of death from operation on the biliary tract, we decided that in the future we would not operate upon patients who showed a high retention of the dye. Therefore given a dye retention of over 35 per cent, Graham believes operation should be postponed until dietary and other measures have reduced these figures.

It appears that one can no longer be content with the mere qualitative detection of urobilin in the urine and sterobilin in the feces. Watson (41) has lately found that a quantitative estimate of sterobilin (urobilinogen) in specimens of urine and feces collected over a period of from one to four days is of great value in the differential diagnosis of possible lesions in the biliary tract. He has also obtained valuable information from the so-called "sterobilin tolerance test, in which sterobilin is injected intravenously.

Among the less generally used tests of hepatic function are the estimates of phosphatase in the blood and tyrosine in the urine; the latter test is more apt to be positive in marked degenerative states of the liver.

A word should be said concerning the syndrome of gonococcal perihepatitis in young women, in gonorrheal infection of the cervix and pelvic viscera. This syndrome described by Curtis (10), Hilton (2) and Fitz Hugh (42) will not rarely confound the diagnosis. At laparotomy the diagnosis will at once become evident by the delicate violin-string adhesions between the

*Normal values: urinary excretion of dye in 100 cc. of urine 10-15 per cent.

liver and diaphragm, the abdomen should be closed forthwith and with pardonable embarrassment and chagrin

When all is said and done, after all supplemental aids are considered a general estimate of the situation is made by the surgeon, and his common sense, good judgment, and valuable clinical experience are still of tremendous importance in the management of the case in hand

PRE-OPERATIVE FACTORS

In everyday practice one cannot make a selection as this would mean denial of surgical benefits to a large percentage of patients. The only alternative is to institute pre-operative therapy designed to remedy, so far as is possible, the injuries previously sustained by the liver, and defer operation until the patient's condition is sufficiently improved to make the risk small enough to warrant its being undertaken

It has been recommended by Hewitt (20) that because "for many years it has been recognized that the depletion of glycogen, stored in the liver, definitely reduces its functional efficiency, and that the administration of carbohydrates and the building up of the glycogen store of the liver hasten repair of liver damage," an excellent safety factor would be to check liver function again after glucose and saline administration. Only when the response to this therapy showed an approximation to normal conditions would it be safe to undertake operation

One feature of the ordinary case of obstructive biliary disease is the incomplete digestion and absorption of fats and the loss of the bile salts which are excreted in the urine. The normal circulation of these salts between the liver and the intestine is disorganized and depleted by the constant drawing off of these salts into the urinary tract. Because the body is not getting its quota of fatty acid, it is forced to deplete its carbohydrate and amino-acids reserves

Correction of these conditions may be made by a system of substitution therapy such as is recommended by R. Douglas Wright (44) of Melbourne, Australia. There must be "administration of fat and bile in a form which will be liberated in the presence of pancreatic juice and in a quantity sufficient to have a therapeutic effect. The first requisite is obtained by coating the bile with salol (its bitter taste and irritant action on the stomach preclude its being given otherwise). The normally secreted 30 grammes (500 grains) of bile solids per day is too much to give conveniently. Forty-eight pills of 0.3 gm (5 gr) were given to 1 patient whose case is used for

illustrative purposes. The diet was carbohydrate 150 gm, fat 100 gm, and protein 70 gm. He adds "A very definite improvement in fat absorption and metabolism at once became manifest"

Such a regimen may be of great assistance in restoring the carbohydrate and fat metabolism to normal and is an added factor of safety from the anesthetic risk by preventing acidosis. It should be emphasized, however, that these dietetic measures cannot usually be substituted for the administration of glucose, saline solution, calcium chloride, and Vitamin K

It has been stated by Crile (9) that "with a low vitamin diet, especially one that lacks the fat-soluble vitamins A and D, gall stones are more apt to occur. If a diet high in these vitamins, that is, one containing leafy foods and cod liver oil, or other fish oils, is used, gall stones disappear more rapidly in animals, whether the stones were placed in the biliary tract, or were produced by avitaminosis"

Johnson, Ravdin, and their coworkers (24a), in a study of the effect of diet on the composition of the liver in the presence of obstruction of the common bile duct, have found that a diet with high carbohydrate, high protein, and *no fat* spares liver protein. The regeneration of the liver cells requires an adequate protein intake. Three hundred cubic centimeters of 5 per cent glucose yields only 600 calories and is only $\frac{1}{3}$ of the daily basal requirement. Therefore, carbohydrate and protein should be given liberally by mouth whenever possible. Carbohydrates displace liver fat and spare liver protein, this regimen protects the liver from toxic substances such as volatile anesthetics. A high glycogen liver content protects the liver against fatty degeneration and a low liver glycogen tends to be associated with a high fatty content and destruction of liver protein

Altshuler and his coworkers (1) used a sterile mixture of amino-acids, which are a hydrolysate of casein, to which was added 18 per cent tryptophan, 15 per cent cystine with 5 per cent glucose and 7 per cent sodium chloride. This is a clear amber fluid with a content of 7 gm of amino-acid nitrogen per 100 c cm. This fluid is mixed with an equal amount of sterile water. It is administered either intravenously or subcutaneously, 1,000 c cm being injected over a period of from four to five hours. It is well tolerated and almost completely utilized. Since peptones and higher fractions of the protein molecule are not well tolerated by the body, the method of Altshuler and his coworkers represents a step forward in the maintenance of protein equilibrium

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anesthetic such as chloroform with oxygen is just as effective in preventing liver necrosis as is a high carbohydrate diet for several days prior to anesthetization

Postoperative pulmonary complications are notoriously high in surgery of the biliary tract. Therefore, meticulous precautions should be taken to maintain the warmth of the patient, to insure adequate ventilation of the lungs, to prevent emesis, and to insure freedom of the trachea and bronchi from secretions

FACTORS DURING OPERATION

It is the consensus of opinion among most experienced biliary-tract surgeons that early operation is advisable. Palmer (31) says, "The first and largest factor in biliary deaths is the delayed operation which permits of a train of physiological changes that occur with time's passing." He protests against "combined operations for complicating and accessory pathology," and also laments the "insufficient supportive treatment immediately before and after operation to overcome the handicaps of coexisting pathology."

The trials and tribulations of both patient and surgeon in some cases are only too well known to require much comment.

Erdmann (13) tells of a patient who had been operated upon three times before coming under his care. At the time he first saw her she had a fistula and marked jaundice. The first intervention had been a cholecystectomy and the two that followed had evidently not been complete procedures. At his first attempt Erdmann followed the Lahey method but, "after a supposed establishment of a well lined fistula the sinus closed. Her fifth operation and my second was a success—a hepaticoduodenal anastomosis was done."

Hawkins (18) is of the opinion that too many gall-bladder operations are done in unnecessary haste and he urges more attention to pre-operative preparation. "forty-eight hour pre-operative regimen of a high carbohydrate diet and glucose intravenously is a crutch to the liver which will be greatly appreciated by the surgeon postoperatively. It is extremely rare that gall bladder disease demands emergency operative measures and undoubtedly the mortality from cholecystectomy would be appreciably lowered if none but the most extreme were ever viewed in the light of emergency cases." However, if operation could be undertaken earlier in the course of the disease, the necessity of intervention in acute conditions could be avoided. Practically all surgeons advise against operating upon very acute cases, but

despite these warnings, the emergency cases still come for relief.

In discussing "liver deaths", Heyd (21) brings forward as an argument in favor of early operation that "by earlier operation some of these patients would have been cured by preventing the development of malignancy. All of them had gall stones and gave a history of long continued gall bladder disease." He says that earlier intervention would have obviated these deaths.

Anomalies (Figs 1 and 2) The operator who seeks to surround his patient with every safeguard should be thoroughly familiar with the anatomy of the region before undertaking any operation upon the biliary tract. McWhorter (29), a number of years ago, found in 46 cadavers that the cystic artery or its parent trunk passed posteriorly to the bile ducts 19 times and anteriorly 16 times, while in the remaining 11 subjects the relations were sufficiently unusual to be classed as "anomalies." He is convinced that the varying relations of the cystic artery with the frequent occurrence of a double artery (he found the cystic artery doubled in 6 or 13 per cent of his 46 cadavers) and inconstancy of the relations of the hepatic branches contributed to the frequency of hemorrhage at operation. Babcock, however, attributes such hemorrhage to the relatively high internal pressure in the arterial branches because they are so close to the aorta and suggests special care in the ligation of the cystic artery. "It should be tied with care, preferably with silk which is not so liable to slip from a small vessel as is catgut."

Sandruni (37) states that anomalies of the biliary tract occur with sufficient frequency to be of clinical significance. He reports a case of a twenty-two-year-old soldier wounded in the right hypogastric lumbar regions. Operation showed an injury of the liver and kidney and a hematoma of the gall bladder. The right hepatic duct entered the cystic duct at the neck of the gall bladder and the left hepatic duct entered the cystic duct a little lower to form the common bile duct. He cites observers who have reported complete absence of the gall bladder and a case in which the gall bladder resembled the appendix. The most frequent anomaly is a lateral implantation of the cystic duct into the neck of the gall bladder so that a diverticulum is formed at the lower end of the ampulla. Other rather frequent anomalies are cases in which the cystic duct joins the hepatic duct at an angle (acute) after running parallel with it, and cases in which the cystic duct assumes an anterior or posterior spiral course to the hepatic duct entering the latter either laterally, medially, or posteriorly.

when protein administration is of urgent importance.

Of course whole blood, plasma, and serum at present still afford the most rapid means of protein administration.

An adequate pre-operative supply of Vitamin K and bile salts for the correction of prothrombin deficiency and the prevention of hemorrhage is of much greater immediate importance. Ansbacher and Fernholz (2) Andrus and Lord (12) and others have successfully used the synthetic product 2 methyl 1 4 naphthaquinone in place of Vitamin K.

All writers stress the importance of maintaining normal salt and water balance and of making frequent sodium-chloride and hematocrit determinations. Should the blood chlorides fall below normal, intravenous injections of normal saline solution are advisable. Accurate records of fluid intake and output are essential with allowance also for fluid lost in the expired air and through sweating and insensible perspiration.

Ravdin (31) quotes Waltman Walters as calling attention to the importance of operating on severely jaundiced patients when the level of the bile pigment retention in the blood is more or less stationary. The patient operated upon when the Van den Bergh reaction shows a constant level of the serum bilirubin is better able to withstand the additional trauma of operation than is the patient who is operated on in the face of a rapidly rising bile-pigment concentration in the blood.

Since carbohydrates are the major source of liver glycogen, some attempt should be made to increase the carbohydrate intake prior to operation. This may in part be accomplished by high carbohydrate feeding by mouth, reinforced by the intravenous administration of glucose. It must be remembered, however that even though the glycogen store is temporarily replenished, it is again rapidly depleted by the very factors which initiated the process in the beginning—ductal obstruction. The glucose given pre-operatively should be administered very slowly since the sugar tolerance is greatly reduced. From 50 to 100 gm. of glucose introduced in from ten to twenty minutes will let fully half spill over into the urine within short time. It has been Ravdin's experience that spill into the urine will not occur if not more than 30 gm. per hour are given intravenously to the average-sized adult.

Ravdin and his coworkers (33 36) believe it best to prepare every patient as though he were at least a potential bleeder. There is no reason for using calcium solutions for there is usually no calcium deficiency in obstructive jaundice. Every

patient should be given a high carbohydrate diet by mouth and this may be reinforced by the daily intravenous administration of glucose. Ravdin gives his jaundiced patients a transfusion several times before operation and should hemorrhage occur postoperatively transfusion is again resorted to. The author has transfused a patient 22 times before the bleeding tendency was brought under control. The frequency of transfusion and the amount of blood used must be determined for each patient, but it is far better to use too much blood than too little.

ANESTHESIA

The choice of an anesthetic is in most instances one of personal preference. Hewitt condemns spinal anesthesia, saying that while it does not bring additional trauma to the liver it "is not always satisfactory and is not without danger." Labey on the other hand, declares that "in the particular situation where there is an infection in the liver provided the spinal anesthesia can be given by men who are qualified to employ it and meet its emergency it is nearly ideal" but it must be given by experts and it must not be given to the bad risk cases. For the "bad risks" he recommends ethylene combined with regional anesthesia.

Nitrous-oxide gas in combination with local infiltration and, if needed, small quantities of ether is the choice of some surgeons. Crile's views on this method are well known, and the low incidence of fatal outcomes in clinics where this form of anesthesia is used as a routine would seem to be conclusive evidence that combined methods of anesthesia may be included among the safety factors in biliary-tract surgery.

Factors which have contributed to a reduction in the morbidity of biliary tract operations in Ravdin's hands, giving greater safety to bad risk patients, are spinal anesthesia if preceded by the administration of epinephrine as suggested by Ferguson and North (*Surg. Gynec. & Obst.* 1932, 56) not exceeding 150 mgm. of novocaine, to avoid an alarming fall in the blood pressure. Contrary to general opinion, he believes, nitrous-oxide and oxygen anesthesia is not safe in the jaundiced patient. The increased anoxemia which this anesthetic induces in the liver cells may prove of serious consequences, because of its producing further liver degeneration and necrosis. On the other hand, cyclopropane which permits the use of a high concentration of oxygen, may prove to be a very safe anesthetic in these cases. If ether is used it must be with a plentiful supply of oxygen. Ravdin has shown that the volatilization of an

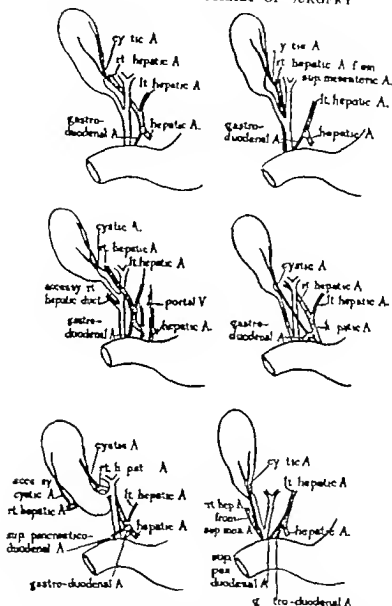


Fig. Abnormalities of the arteries and bile ducts. From Samuel Wynn, Diseases of the Liver, Gall Bladder, Ducts, and Pancreas. Courtesy of Paul B. Hoeber Inc. N.Y.C. 935.

Other anomalies cited by Sanddini are bifurcation of the cystic duct and obliteration of the hepatic duct.

Accessory hepatic duct entering directly into the gall bladder or into the cystic duct.

The right and left branches of the hepatic duct are united into the normal bile duct but two accessory ducts join the gall bladder.

The right and left hepatic ducts enter directly into the gall bladder and the cystic duct continues as the common bile duct.

Double duodenal openings of the common duct. The right hepatic duct enters directly into the duodenum.

The cystic duct joins the common bile duct about 1 cm from the ampulla of Vater.

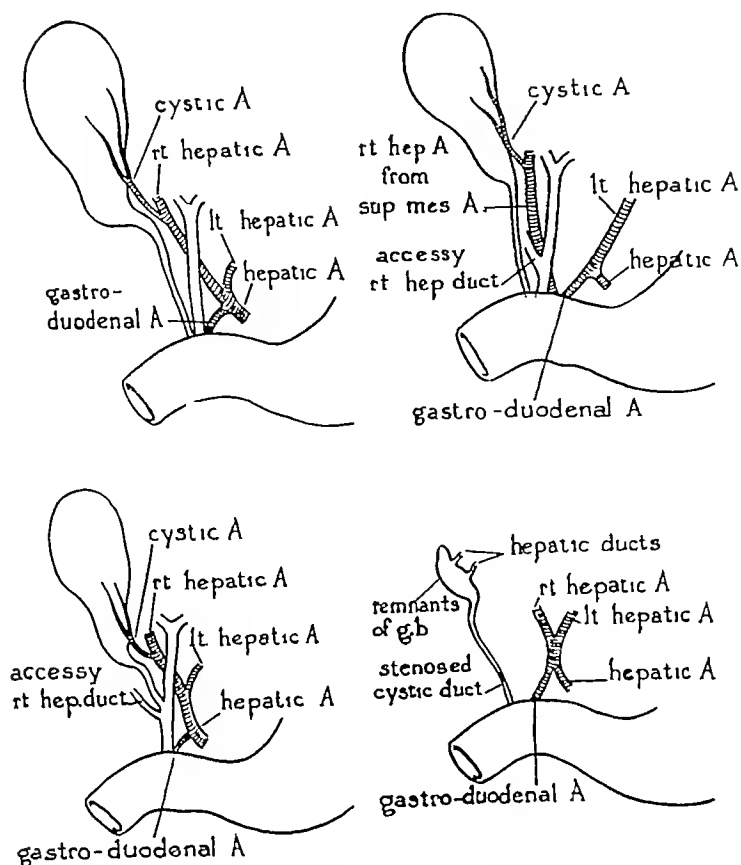


Fig. 2 Abnormalities of the arteries and bile ducts, continued From Samuel Weiss, "Diseases of the Liver, Gall Bladder, Ducts, and Pancreas" Courtesy of Paul B Hoeber, Inc N Y C 1935

The hepatic ducts enter the neck of the gall bladder and the cystic duct continues as the common bile duct.

Sutton (38), by ligation of the hepatic arteries in dogs, has experimentally produced the so-called high temperature "liver death syndrome" (acute postoperative necrosis of the liver). This syndrome consisted of high fever, falling blood pressure, circulatory collapse, coma, and death, with a temperature as high as 109° Fahrenheit within from thirty-six to forty-eight hours after the operation. His work should help one to keep always in mind the necessity for adequate exposure and accurate observation before ligation of structures.

Babcock's (3) method of dealing with anomalous and accessory bile ducts includes the insertion of a small rubber drain to the region of the cystic duct as a routine measure in all operations. He remarks that "the surgeon is not infrequently amazed at the escape of bile from such a tube,"

after he believes he has securely closed all avenues for its leakage. Such a tube should be very carefully placed both in the wound and in the dressing so that it is not kinked or otherwise occluded. Particular emphasis is laid on this as a safety factor, as "the free leakage of bile into the peritoneal cavity, unless promptly corrected, will result in a fatal peritonitis in over 50 per cent of the cases."

The incision. The selection of an incision which will lessen the likelihood of occurrence of postoperative hernia is essential. A transverse or obliquely transverse incision through muscles which permits adequate exposure prevents the maintenance of intra-abdominal pressure and evisceration.

Anesthesia can be much less deep if the patient be deprived of his normal power of thus increasing the intra-abdominal pressure. If a muscle cut transversely to its long axis be accurately sutured it will heal perfectly, providing its enveloping

fascia are restored. Placement of incisions to avoid injury to nerves supplying the musculature is of greatest importance.

The precautions used by Babcock include prevention of postoperative hernia by a muscle splitting operation in which the skin is divided nearly transversely on the line of the seventh intercostal space, from the anterior axillary line to the middle of the right rectus abdominis. The fibers of the external oblique muscle are separated, the anterior and posterior sheaths of the right rectus divided and the rectus muscle is retracted to the left.

Ravdin states that subcostal incision has several anatomical advantages in biliary surgery. It provides access to a wide area of the liver edge. It is not necessary to sacrifice more than one intercostal nerve supplying the rectus muscle and because of the peculiarity of anastomoses of the nerve supply to the rectus, the severance of this nerve does not jeopardize the motor supply to the muscle. The exposure of the common duct is superb. The duct can be approached from the right as the closest structure in the right free border of the gastrohepatic omentum and damage to important structures is made less likely. Drainage can be easily brought out through the lateral abdominal wall. The anatomical relations at the junction of the cystic and common ducts must be carefully visualized, for damage to an abnormally placed right hepatic duct may prove difficult to repair even though the injury is observed during operation. Ligation of an anomalous hepatic artery will result in death, a catastrophe which has frequently been sacrificed to cardiac failure.

Briefly in summarizing, the incision and its closure should take into consideration the following cardinal points:

The *axis* should be adequate. This may seem axiomatic but so often does the operator come to grief because of failure to adhere to this rule that it bears repetition again and again. *Taken in preparing a ample exposure is almost very well paid.*

2. Vertical incisions or vertical portions of combined incisions are best confined close to the median line at which point the nerves are far from harm a way.

3. A subcostal incision is best not carried further laterally than the external border of the rectus muscle. This will prevent mass injury to several intercostal nerves entering the abdominal field in this vicinity.

4. Incisions lateral to the lateral border of the rectus muscle should be in the line of the abdominal portions of the intercostal nerves. The

fibers of the external oblique muscle are separated. The other flat abdominal muscles may be cut but should be later very accurately sutured to insure perfect healing.

5. All muscle-enveloping fascia must be accurately restored, with interruption of the suture at several points in extensive incisions.

6. Incisions in the rectus abdominis are best made transverse since the fascial fibers run in this direction. This incision also protects the nerves. It is permissible and often advisable to section the rectus muscle to obtain adequate exposure.

Exploration of the common duct. The question as to whether or not the operator should routinely explore the common duct is always of importance and interest. Crile says that the common duct should be opened only (1) if there has been chills, pain, and fever (2) if the common duct is dilated (3) if jaundice not otherwise accounted for, appears and (4) if stones can be palpated. However the common duct is so often injured during cholecystectomy that surgical attention to it is frequently imperative. Jones (25) advocates "prevention of such injuries by visualization at the time of cholecystectomy" which means, of course, employment of an incision which permits adequate exposure. This will likewise reveal the occasional anomaly which introduces such uncertainty into even the most carefully thought out procedure. The damage takes place because a great deal of traction is put on the gall bladder angulating the common duct, with the result that either an oval segment is taken out of the duct by the curved clamp or the duct is cut across completely. Labey's writing of common-duct strictures seen after operation, says, "careful preliminary isolation of the cystic artery and its clamping and ligation before the cystic duct is cut in cholecystectomy will prevent most of the cystic or hepatic artery hemorrhage which, in turn, will prevent duct injury and the production of duct strictures."

In common duct drainage, says Haas, there are several pitfalls to be avoided: first, the incision in the duct need not be larger than to permit the insertion of a folded T drain, or the removal of stones and, secondly, meticulous attention should be given to the condition of the rubber T tube itself. It is quite embarrassing in attempting to remove the drain postoperatively to pull out only the upper portion."

Ravdin advises that the common duct should be opened if dilated, even if there be no jaundice. In this he agrees with Labey (*J. Am. Med. Ass.* 929, 93 9 7). Stones are frequently present and the time to remove them is at the initial op-

eration He drains with a small, soft rubber tube, though many authorities advise against such drainage Patients with long-standing or complete common-duct obstruction should have a slow decompression of the biliary passages after operation This can be accomplished in a manner similar to decompression of the urinary bladder, except that the means of preventing too rapid outflow of bile must be provided in a somewhat different manner An apparatus has been devised by Ravdin and his coworkers which can be adjusted at will to regulate the external drainage of bile after cholecystectomy or other biliary surgery, and to direct the outflow into the duodenum It is only necessary that the pressure from the decompression apparatus be sufficient to overcome the tonus of the sphincter mechanism at the lower end of the common bile duct for the bile to flow freely into the duodenum As the bile enters by its normal route, appetite will usually improve at once and "pancreatic asthenia" will not be observed during convalescence

One of the main factors which influence the chronicity of cholangitis, according to Judd, is the multiplicity of poorly drained parietal sacculi in the walls of the ducts throughout the whole biliary tree When once established, the infection in these tortuous racemose diverticula is exceedingly difficult to eradicate unless some adequate means of drainage is provided, such as may be maintained by insertion of a Kehr-Deaver tube

POSTOPERATIVE SAFEGUARDS

Postoperative colic, patency of the common duct For control of colic which persists after removal of the gall bladder, Babcock has found daily injections of small doses of insulin very useful, and this therapy has been recommended by other surgeons

Butsch, McGowan, and Walters (6) found that morphine constricts the sphincter of Oddi and raises the pressure in the common bile duct to 300 mm of water, which is the secretory pressure of the liver Thus, morphine, at least alone, would not be a good drug to administer after operation to a patient who has a low liver reserve For the same reason, a drug which elevates intrabiliary pressure should be used with caution in cases of biliary fistula or in cases in which a biliary fistula is feared These authors found nitrates effective clinically, both in reducing an elevated biliary pressure and in relieving the accompanying pain They obtained complete relief clinically in a series of cases of postcholecystectomy colic by the use of glyceryl trinitrate There was not sufficient opportunity to observe the action of theophylline

ethylenediamine (aminopyllin) clinically All the alkaloids of opium commonly used as analgesics cause a rise of intrabiliary pressure and may prolong the pain for the relief of which they have been given

More recently the use of atropine or syntropan by injection, nitroglycerin under the tongue, and saline laxative by mouth or stomach tube has been resorted to for the relief of sphincter spasm If the common duct has been drained, the injection through the drainage tube of warm olive oil and/or saline solution to remove gravel, and of one of the radiopaque dyes (diodrast) to rule out a stone possibly left behind and to verify the patency of the common duct has been recommended

Judd determines duct patency by fluoroscopy after the injection of radiopaque oil through the external arm of the drainage tube By this means one can determine also the feasibility of removing the tube Judd remarks that many patients in the later decades of life are in poor condition to withstand the extensive operation so often required because of the presence of stones or other serious complications However, even under those circumstances, careful preparation will often enable an aged and debilitated person to pass safely through the intervention He reports the case of a woman of seventy-four, on whom choledocholithotomy, cholecystectomy, and choledochostomy were performed in one stage Prolonged free drainage was instituted with a T-tube in the common duct, where it remained from August 10 to September 7, the patient leaving for home on September 12 in excellent condition In another case, that of a man forty-three years old, the T-tube was left in for six months and a half

Ravdin finds a slow intravenous drip of glucose and saline solution of great value After the release of biliary-tract obstruction, glucose aids the recovery of the hepatic cells In severe or prolonged jaundice, repeated transfusions of from 250 to 500 c cm of blood, once or twice a day may reduce the incidence of hemorrhage and bring about smoother convalescence If bleeding occurs, more and larger transfusions are given The blood count and blood pressure are kept at safe levels no matter how much blood may be necessary to accomplish this

Causes of death Ravdin and his coworkers believe myocardial failure to be one of the major causes of death They cite Riesman and Babcock (*J Am M Ass*, 1909, 73:1929) as having independently suggested that the streptococcus, the most frequent organism found in biliary-tract infection, also causes myocardial degeneration

They believe that patients with serious cardiac disease at the time of operation probably had some initial cardiac lesion prior to the biliary tract disease. These patients, if not protected during and after operation, present serious risks, but these authors' experience shows that cardiac improvement will follow properly safeguarded biliary surgery. A cholecystostomy under local anesthesia may give gratifying results.

Walters writes that improved therapy has decreased pulmonary and other complications at the Mayo Clinic. In operations for cholecystitis in 1937 there were 11 deaths from bronchopneumonia (1.1 per cent) while in 1938 there were 4 deaths (0.4 per cent). Among factors responsible for this reduction are sulfanilamide, sulfapyridine and allied substances, bronchial aspiration, the use of oxygen, blood transfusions, and specific sera in certain types of pneumonia. The surgical staff can call at all hours upon the internist group. Vitamin K and bile salts have reduced hemorrhage in jaundiced patients and possibly their administration has improved liver function. The principal causes of death were (1) bronchopneumonia, (2) hepatic insufficiency, (3) cardiovascular renal disease, and (4) pulmonary embolism.

Heyd (218) in a study of the mortality factors in 4,000 operations upon the external biliary system, reported 309 deaths, or a mortality of 7.7 per cent. He concluded that chronic biliary disease is a progressive pathological condition, morbidity and mortality being dependent upon (1) the duration of the disease, (2) the pathology present, (3) the complications, and (4) the physical condition of the patient.

Mortality in relation to pre-operative preparation.

TABLE II.—THE MORTALITY AND MORBIDITY IN ACUTE CHOLECYSTITIS IN RELATION TO THE LENGTH OF PRE-OPERATIVE HOSPITALIZATION.

Duration of observation period	No. of cases	Per cent perished	Mortality per cent
to 6 hours	25	—	5.6
6 to 24 hours	207	1.4	7.4
24 to 48 hours	56	8.6	35
to 24 days	93	2.8	7.00
Totals	374	—	7

An immediate operation for acute cholecystitis, within six hours after admission, is only seldom indicated. To insure best results, from six to twenty-four hours of pre-operative preparation is indicated. On the other hand, operation and preparation for much over forty-eight hours again increased the risk.

Mortality in relation to pathology

TABLE III.—ACUTE CHOLECYSTITIS, PATHOLOGICAL ANALYSIS OF 574 OPERATIONS.

Pathological diagnosis	No. of cases	Per cent of total	Mortality per cent
Acute cholecystitis	206	36	5.85
Perforated cholecystitis	7	1.2	9.40
Gangrenous cholecystitis	30	5.0	7.33
Perforation, 11th abscess	6	1.0	60
Perforation, 11th peritonitis	53	9	35.85
No pathological report	3	0.5	34.40
Total cases	374	100	9.7

Any grade of jaundice increases the mortality in chronic cholecystitis; the mortality rate is 13 per cent in 254 cases of jaundice at time of operation, and 85 per cent of these had stones in the common duct. In 574 cases of acute cholecystitis, 548 cholecystectomies were done; 31 patients had a cholecystostomy. In 46 cases of perforation of the gall bladder with chronic cholecystitis there was a mortality of 19.5 per cent; 9 of these patients had perforation into the colon. If involvement of the common duct in gall-bladder disease raises the mortality from 3.61 to 11.4 per cent. Surgery of the common duct gives a mortality 3 times as high as uncomplicated cholecystectomy. Previous attacks of jaundice increased the mortality. Jaundice itself increases the mortality by 100 per cent.

Mortality in relation to the percutaneous procedure. In the early series since 1930, exploration of the common duct was done only for marked disease of the duct or associated pancreatitis. Later with improved technique more primary explorations of the duct were done. Drainage of the duct for calculus or cholangitis at the initial operation done with cholecystectomy gave a mortality of 1.34 per cent, whereas choledochostomy following initial cholecystectomy gave a mortality of 38.6 per cent. The lowest mortality occurred in a series of 959 patients who were operated upon no longer than two years after gall-bladder symptoms started (1.35 per cent).

Cholecystostomy for chronic cholecystitis is inadequate. Sixty-eight patients were operated upon a second time following cholecystostomy for recurrent symptoms with a mortality of 7.4 per cent.

Choledochostomy for postoperative tension of the common bile duct or stones previously overlooked gave almost a 40 per cent mortality. Combination of operations is conducive to high mortality. In 575 operations, cholecystectomy combined with other procedures gave the mor-

tality of 13.85 per cent. The mortality is even higher when such operations as appendectomy for gangrene, gastroduodenal ulceration, or fibromyoma of the uterus are carried out with cholecystectomy.

Cholecystostomy was done in 2 per cent of the operations for chronic gall-bladder disease. In 3,306 operations for chronic cholecystitis, cholecystostomy was done 66 times with a mortality of 33.3 per cent. Cholecystogastrostomy was done 50 times and cholecystoduodenostomy twice, the mortality was 28.8 per cent. There were 52 anastomotic operations for carcinoma and 16 for pancreatitis with obstruction.

Postoperative pulmonary complications

Atelectasis and pneumonia. Biliary-tract surgery is notorious for its aftermath of lung complications. The pathogenesis of these complications is becoming more and more understood and appreciated. Curiously enough, the type of anesthesia does not appear of paramount importance in their production. Of greater importance is the debilitated state of the patient, the depressing effect of narcotics and anesthesia on respiration, and the accumulation of infected bronchial secretions due to a combination of poor mouth hygiene, narcotics, anesthesia, unchanged posture, and constrained breathing due to pain. The admirable review of this phase of the subject by Gius (16) is well worth consulting. No longer should one depend on good fortune for avoiding lung complications, the initiative for their prevention should emanate from the surgeon.

Venous thrombosis and pulmonary embolism. In a study of 100 cases of embolism, De Takats and Jesser (11) found that 60 per cent of the patients lived for more than one hour and 34 per cent for from one to several days following the accident. Thus it appears that time is available for therapy. They summarize the blood changes predisposing to thrombosis and embolism as follows:

An increase in the number of platelets occurs regularly after any major operation with a maximum peak between the eighth and eleventh days, there are an increase in fibrinogen, a shift of the albumin globulin ratio in favor of globulin, and an increase in blood viscosity. All these factors facilitate the agglutination of platelets. The coagulation of blood is favored by the postoperative leucocytosis and the increase of platelets, both of which liberate thrombokinase and hasten the coagulation of stagnating blood adjoining an obstructing platelet thrombus. Blunt dissection, trauma, infection, advanced age, and overweight predispose to thrombosis.

Pulmonary embolism may be ushered in with dyspnea, pain in the chest, cyanosis, a weak rapid pulse, shock, restlessness, nausea, vomiting, abdominal pains, chill, vertigo, convulsions, or rapid death.

Only too often embolism is passed off with a diagnosis of cardiac failure, coronary occlusion, shock and/or hemorrhage, pulmonary edema, coma, or a cerebrovascular accident. De Takats and Jesser point out the marked retardation of blood flow after every major abdominal operation, with narrowing of the axial stream and the assumption of a marginal position by the leucocytes and platelets. Venous backflow is discouraged by immobilization in bed, tight abdominal binders, postoperative pain, intestinal distention, superficial breathing, and diminished excursion of the diaphragm, the emptying time of the inferior vena cava and peripheral veins is prolonged. Pulmonary embolism is not always associated with asphyxia, failure of the right heart, or insufficient venous return to the left heart except when the main pulmonary artery or both its branches are obstructed. De Takats and Jesser found that a small embolus to only a small portion of lung may be fatal which they believe is due to a radiation of autonomic reflexes and vagal effects which can be demonstrated experimentally on the electrocardiogram. These vagal effects constrict the smooth muscle of the coronary arteries, the bronchi, and the upper gastrointestinal tract. Therefore, they use atropine to block the vagus and papaverine to relax smooth muscle in the treatment of embolism. For prophylaxis, besides hydration to prevent slowing of the blood stream, they use a mild Trendelenburg position, with the foot of the bed raised five degrees for twenty-four hours postoperatively to accelerate venous backflow from the extremities and pelvis. Bicycle pedals mounted on the foot of the bed are used by the patient to improve the circulation.

In diametric opposition so far as posture is concerned, Fryholm (15) uses a Fowler position for prophylaxis. The rationale of this procedure is summarized by him as follows:

1. Several series of pathologico-anatomical investigations have been made during the past years and have proved that there are four areas of origin of venous thrombosis: (a) the plantar veins, (b) the veins of the musculature of the calf, (c) the branches of the deep femoral vein in the adductor musculature, and (d) the visceral pelvic veins.

2. When a patient is confined to bed, the veins of the areas mentioned are collapsed or pressed together to a certain degree, so that two intima layers come into close contact.

3. The vitality of the endothelial cells depends, to a great extent, on their contact with flowing blood, and when the cells are deprived of this source of nutrition, disturbances arise in nutrition, as a thrombosing process is begun.

4. Injury to the intima is the most important factor in the pathogenesis of thrombosis. It can be counteracted by raising the head of the bed so that the patient begins to slide downward in bed. Then the venous pressure in the

They believe that patients with serious cardiac disease at the time of operation probably had some initial cardiac lesion prior to the biliary tract disease. These patients, if not protected during and after operation, present serious risks, but these authors' experience shows that cardiac improvement will follow properly safeguarded biliary surgery. A cholecystostomy under local anesthesia may give gratifying results.

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0 to 6 hours	23	—	3.6
6 to 24 hours	297	5	7.4
24 to 48 hours	50	8	33
to 24 days	91	3	7.60
Totals	54	—	47

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Gangrenous cholecystitis	50	8.7	7.33
Perforation, with abscess	6	1	00
Perforation, with peritonitis	53	9	31.85
No pathological report	3	0.5	34.40
Total cases	54	100	47

Any grade of jaundice increases the mortality in chronic cholecystitis; the mortality rate was 3 per cent in 254 cases of jaundice at time of operation and 85 per cent of these had stones in the common duct. In 574 cases of acute cholecystitis, 542 cholecystectomies were done; 32 patients had cholecystostomy. In 46 cases of perforation of the gall bladder with chronic cholecystitis there was a mortality of 19.5 per cent; 9 of these patients had perforation into the colon. Involvement of the common duct in gall-bladder disease raises the mortality from 3.61 to 11.4 per cent. Surgery of the common duct gives a mortality 3 times as high as uncomplicated cholecystectomy. Previous attacks of jaundice increased the mortality. Jaundice itself increases the mortality by 100 per cent.

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Cholecystostomy for postoperative stenosis of the common bile duct or stones previously overlooked gave almost a 40 per cent mortality. Combination of operations is conducive to high mortality. In 575 operations, cholecystectomy combined with other procedures gave the mor-

demonstrated in the area of the gall bladder attachment. The gall bladder was thickened and mottled and no stones were found. A small section of liver was removed for biopsy. After separating the adhesions between the common duct, duodenum, and hepatic flexure of the colon, the common duct was palpated and a calculus about the size of a hazelnut was felt. The common duct was incised and a large quantity of "white bile" was evacuated. The stone was removed with difficulty because of its size. A small T-tube was placed in the common duct. Following this procedure the gall bladder collapsed. It was thought best not to remove it because of the poor condition of the patient. A rubber dam drain was placed in Morrison's pouch.

Postoperative course. On the twelfth postoperative day, bile was still present in the urine with occasional granular casts. The blood showed 1,400,000 erythrocytes and 28 per cent hemoglobin. A transfusion of 500 c.c.m. was given and on the eighteenth postoperative day bile and occasional coarse granular casts were present in the urine. The blood showed 2,900,000 erythrocytes with 38 per cent hemoglobin and another transfusion of 500 c.c.m. was given.

Pathological findings (A. S. Price). A calculus measuring about $1\frac{1}{4}$ cm. in diameter and a portion of the liver measured 2 by 1 cm. by 1 cm. The liver was dark green and densely bile stained, "advanced biliary cirrhosis" and choledocholithiasis.

The patient improved gradually and was discharged twenty three days later.

CASE 5 (No. 2989). A woman, aged fifty, was admitted May 13, 1937, and discharged June 5.

Chief complaint. Pain in the right upper quadrant to the back and right shoulder with vomiting on and off for past twenty years. Had mucous diarrhea for past five years.

Physical examination. Obesity, tenderness in upper right quadrant, abdominal distention.

Pre-operative diagnosis. Chronic cholecystitis.

Operation. Cholecystectomy, repair of fistulous opening in transverse colon under nitrous oxide, oxygen, and ether anesthesia.

Operative findings. The entire neck and fundus of the gall bladder were bound down by dense adhesions to the transverse colon. There were 2 large stones, the size of marbles within the gall bladder. The gall bladder was markedly distended and edematous. The liver was grayish in color. There were no stones in the common duct.

Procedure. The transverse colon was freed from the gall bladder. The fistulous tract between the transverse colon and gall bladder was isolated and considerable purulent material was evacuated from the gall bladder. The gall bladder was incised and 2 large stones were removed. The opening in the transverse colon was repaired and covered with a piece of omentum. The gall bladder was removed and drainage was instituted.

Pathological findings (A. S. Price). The specimen consisted of a gall bladder 10 cm. in length. The wall was thickened and showed areas of ulceration in the mucosa. Two large sized calculi were found measuring 3 and $2\frac{1}{4}$ cm. in diameter. Acute and chronic cholecystitis, cholelithiasis, and periportal hepatitis.

The patient has been enjoying excellent health since the operation except that she developed a postoperative incisional hernia.

CASE 6 (No. 5878). A man, aged forty, was admitted September 26, 1938, and discharged October 23.

Chief complaint. Pain in the upper right quadrant, gnawing in character and recurring several hours after meals for eight years. For the past four years he had had several Lyon's drainages. Roentgenographic examination of the gall bladder gave the impression of an obstructive cholecystitis with stones.

Pre-operative diagnosis. Cholecystitis and cholelithiasis.
Operation. Cholecystectomy, choledochostomy under nitrous oxide, oxygen, and ether anesthesia.

Operative findings. The gall bladder was thickened, grayish white in color, very edematous, adherent to the hepatic flexure of the colon and duodenum. The common duct was markedly dilated.

Procedure. The common duct was opened. A probe was inserted toward the liver and the ampulla below but no calculi were found. Bile flowed freely from the upper portion of the duct. A T-tube was placed in the common duct and the gall bladder was removed.

Pathological findings (A. S. Price). Subacute and chronic cholecystitis and cholelithiasis.

The patient made an uneventful recovery.

CASE 7 (No. 7828). A woman, aged fifty seven, was admitted December 15, 1938, and discharged February 11, 1939.

Chief complaint. On day of admission she was awakened by sudden, severe upper abdominal pain which persisted.

Physical examination. Obesity, acute illness with rigidity and tenderness over gall bladder region.

Pre-operative diagnosis. Acute cholecystitis.

Operation. Cholecystectomy under spinal anesthesia.

Operative findings. The omentum was found firmly adherent to the lateral and anterior parietal wall. There was a large amount of serous fluid in the peritoneal cavity. The gall bladder was edematous, distended, and gangrenous in appearance.

Procedure. The gall bladder was opened and drained by an indwelling catheter. Drains were also placed in the foramen of Winslow and Morrison's pouch.

Complications. Peritonitis, paralytic ileus, and lobar pneumonia.

The patient recovered and was discharged six weeks post operatively.

CASE 8 (No. 154). A woman, aged forty seven, was admitted January 8, 1939, and discharged February 7.

Chief complaint. Two days prior to admission, the patient was seized with pain in the upper right quadrant which had gradually become worse.

Physical examination. Extreme tenderness and rigidity over gall bladder region.

Pre-operative diagnosis. Acute cholecystitis.

Operation. Cholecystectomy under nitrous oxide, oxygen, and ether anesthesia.

Operative findings. The liver showed small, whitish, granular flecks on the superior and inferior surfaces, there were so-called "violin string" adhesions between the dome of the liver and the diaphragm. The fundus of the gall bladder was adherent to a band that ran from the duodenum to the hepatic colon.

Procedure. The fundus of the gall bladder was freed and a cholecystectomy performed.

Postoperative diagnosis. Perihepatitis (gonococcic), chronic cholecystitis. (Cervical smears were, however, negative for gonococci.)

The patient was discharged in good condition on the twenty first postoperative day.

CASE 9 (No. 3431). A woman, aged forty seven, was admitted May 31, 1939, and discharged June 30.

Chief complaint. Pain in right upper quadrant and epigastric distress for the past six or seven years. The patient had had frequent attacks of pain in the right upper quadrant with nausea. The pain would last about an hour, was severe and sharp, and often radiated to the angle of the scapula.

Physical examination. Soft and protuberant abdomen with tenderness over the gall bladder region. The roentgenographic examination showed a large diverticulum of

extremities III rise, so that the veins become distended with blood, and the patient III be forced to make active movements with her legs to maintain her position. Thus the veins which are especially threatened by thrombosis III be rhythmically emptied and distended.

REPORT OF CASES

CASE (N. 400) A woman aged sixty-two, admitted September 9, 1935 and discharged September 9.

Chief complaint: Pain in the upper right quadrant for 12 and one-half weeks radiating to the back and right shoulder. The patient had had similar attacks during the past eight years. Its belching and distention after meals.

Physical examination: Well developed and nourished female with tenderness over the right upper quadrant. The conjunctivae and sclera showed yellow tinge.

Laboratory findings: The blood sugar 80 mgm.; non-protein-nitrogen 23 mgm.; ketonuria index 0; carbon-dioxide-combining power 90.4; Van den Bergh (direct) delayed reaction, (indirect) positive. Cholesterol 235 mgm. Ehrlich's aldehyde reaction for aroclins as positive.

Pre-operative diagnosis: Chronic cholecystitis, cholelithiasis, hepatitis, cholangitis, and pancreatitis, twenty-four hours after operation, transfusion of 500 cc. of blood as given.

Operation: Cholecystectomy and choledocholithotomy under spinal anesthesia.

Operative findings: On opening the peritoneal cavity, serous fluid was evacuated. The liver was green, lobulated and hard. The pancreas as hard and flattened. A large mass as found attached to the duodenum and extended up toward the liver. Attached to this mass as contracted obliterated stones gall bladder. The common duct was opened and a large calculus was removed. A T-tube was placed in the common duct. A cigarette drain as placed in Morison's pouch.

Twenty-four hours postoperatively transfusion of 500 cc. of blood as given.

Postoperative course: The biliary drainage was free. The patient as restless and irritable and refused nutrition by mouth. The pulse ran thereby respirations increased rapidly, and the patient expired thereafter.

Pathological findings: (A. S. Price) Cholelithiasis.

CASE (No. 4457) A woman, aged thirty-nine, as admitted July 20, 1936, and discharged August 9.

Chief complaint: Pain in the epigastric region. Three months previously she had had severe cramp-like pain in the lower right chest radiating to the small of the back and shoulder blade.

Physical examination: Well developed rather obese, hirsute female very jaundiced and evidently in pain. There as tenderness and spasticity in the right upper quadrant. Pre-operative diagnosis Chronic cholecystitis.

Operation: Cholecystectomy and choledocholithotomy under nitrous oxide, oxygen, and ether anesthesia.

Findings: The liver as large, markedly degenerated and friable. The gall bladder was of yellow, hite color and collapsed. The common duct as dilated and the head of the pancreas very firm.

Procedure: The peritoneum was incised over the common duct and very short cystic duct was brought into view. The common duct was incised and probe was passed into the duodenum and no calculus were found. A T-tube as placed in the common duct and the gall bladder was removed.

Postoperative diagnosis: Chronic cholecystitis. Hepatitis. Pancreatitis.

Pathological findings: (Price) Chronic cholecystitis. The patient made an uneventful recovery.

CASE 3 (No. 4603) A woman, aged 51 years was admitted November 6, 1936, and discharged December 20, readmitted June 9, 1937 and discharged June 9.

Chief complaint: Severe pain in upper right quadrant, nausea and belching of gas on and off for ten years. A day before admission the pain became unbearable. A few days before admission she became jaundiced.

Physical examination: Pain and tenderness in upper right quadrant. Its jaundice.

Pre-operative diagnosis: Empyema of gall bladder.

Operation: Cholecystectomy with removal of stone from the cystic duct under nitrous oxide, oxygen, and ether anesthesia.

Operative findings and procedure: The gall bladder as about 5 in. in length, very distended, and tender. After evacuating the gall bladder of bile, the common duct was examined and no stones were found. There was small stone at the mouth of the cystic duct. It was as pushed into the wound and removed. The liver as greenish gray in color. A cholecystectomy as done.

Pathological findings: The specimen consisted of soft, bile calculus measuring by cm. The patient as discharged twenty-one days after admission. Its biliary fistula. The patient as readmitted on June 23, 1937 on account of biliary fistula.

Pre-operative diagnosis: Stone in common duct.

Re-operation: Cholecystolithotomy. Cholecystectomy under nitrous oxide, oxygen, and ether anesthesia.

Operative findings: Small stone in common duct and pericholecystic adhesions.

Procedure: The scar of the previous operation was excised and the stones tract as diverted. The adhesions between the gall bladder and omentum were freed. The adhesions between the neck of the gall bladder and duodenum were released by sharp dissection. The gall bladder was markedly edematous and very long. A stone the size of small marble as located in the common duct (supraduodenal). A 3/4 cm incision as made in the common duct. The stone as removed and the duct as drained. The gall bladder as removed. A cigarette drain as placed against the surface of the liver and another down to the opening of the common duct through which the soft rubber catheter emerged.

The patient improved and as discharged from the hospital June 8, 1937. Its fistula had healed in weeks later. The patient has remained well since.

CASE 4 (No. 750) A woman, aged forty-four, as admitted February 6, 1937, and discharged April 3.

Chief complaint: Jaundice and belching. The patient had had gall bladder and stomach trouble for 8 years, sour eructations, and "burning" pain in the epigastrium for months previously. She had had pain in the right upper quadrant and slight jaundice followed by rapid improvement. Eight days before admission, she as seized with sharp pain in the gall bladder region radiating to the back and across the abdomen. The left flank and required morphine.

Physical examination: This patient as short, stout and markedly jaundiced.

Laboratory findings: Erythrocytes 4,400,000; hemoglobin 45 per cent; non-protein-nitrogen 34; urea nitrogen 33 mgm.; bilirubin 5.0; acetone index 33. Urine 355 the urine was strongly positive for bile and contained occasional, coarse granular casts.

Pre-operative diagnosis: Chronic cholecystitis and calculus in common duct.

Operation: Choledocholithotomy under nitrous oxide, oxygen, and ether anesthesia.

Procedure and operative findings: A green liver presented itself with multiple, large nodules, quite thickly

Procedure The stone was moved upward above the duodenum with great difficulty and removed through an incision in the common duct. A soft catheter was introduced into the hepatic duct. Irrigation of the hepatic duct yielded a few pieces of gravel. The same catheter was reversed downward toward the ampulla and the common duct was irrigated with saline solution. T tube drainage was instituted. A rubber dam drain was placed in the foramen of Winslow. A cholecystostomy was performed. A rubber dam drain was placed in Morison's pouch.

Pathological findings The specimen consists of a calculus of mixed type about 10 mm in diameter.

Postoperative course The patient's condition was satisfactory. He drained considerable bile at first, which was very black and finally became golden yellow, but his jaundice did not clear. On roentgen films of the biliary tract, taken January 11, following the injection of diodrast through the T tube, the common duct, hepatic duct, and second portion of the duodenum were well visualized. There was free flow of dye through the common duct into the duodenum and no evidence of calculus in the biliary tract. Following this, the T-tube was removed. The fistulous tract closed in two weeks. The jaundice has not quite entirely cleared to date.

CASE 13 (No 335) A woman, aged sixty, was admitted January 15, 1940 and discharged February 14.

Chief complaint Occasional attacks of "indigestion" for several years. She had had a cholecystostomy twelve years previously. A recent roentgenogram of the stomach and duodenum showed a pyloric obstruction very likely due to carcinoma and a duodenal diverticulum.

Physical examination An obese woman with a yellow tinge to the skin and conjunctiva, and with tenderness in the right upper quadrant and over the scar of previous operation.

Pre-operative diagnosis Pyloric obstruction and duodenal diverticulum.

Operation Cholecystectomy, inversion of diverticulum, and liberation of dense adhesions encircling the region of the pylorus under nitrous oxide, oxygen, and ether anesthesia.

Operative findings and procedure On opening the abdomen, dense adhesions were encountered between the liver, omentum, and pylorus. No sign of ulcer or carcinoma of the stomach or pylorus. The pancreas and common duct were considered normal. The adhesions were separated. The gall bladder, which contained no stones, was freed from the adherent structures and removed. A diverticulum presented in the anterior surface of the second portion of the duodenum. It was $\frac{3}{4}$ in in diameter and its base about $\frac{3}{4}$ in in diameter. The diverticulum was rather thin, it was inverted into the duodenum with a purse string suture of fine silk. A cigarette drain was introduced into the foramen of Winslow.

Pathological findings (A. S. Price) The gall bladder was about 8 cm in length. A number of cholesterol deposits were found in the mucosa ("strawberry gall bladder"). Chronic cholecystitis.

The patient was discharged in excellent condition and has remained well since.

The author is indebted to Drs. John J. McGrath and Robert E. Brennan, Professors of Surgery, and Dr. James P. Croce, Professor of Medicine of the New York Polyclinic Medical School and Hospital, for their invaluable cooperation.

SUMMARY

The utilization of safety factors in the modern treatment of biliary-tract diseases presupposes a

knowledge of their pathogenesis, of the anatomy and anomalies of the region, and of biliary physiology and pathological physiology.

Such knowledge, together with good judgment, skill, and experience, constitutes the surgical wisdom which is essential for diagnosis and for the logical and safe pre-operative, operative, and postoperative management of the patient.

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the second portion of the duodenum. The gall bladder as poorly visualized.

Pre-operative diagnosis. Chronic cholecystitis and diverticulum of the descending portion of the duodenum (outer wall).

Operation. Excision of diverticulum, cholecystectomy under nitrous oxide, oxygen, and ether anesthesia.

Operative findings and procedure. The duodenum as explored from the pylorus to the beginning of the third portion by mobilizing it according to the method of Kocher. The diverticulum as found on the descending portion of the duodenum. On the outer lateral wall, a large clamp as placed on the duodenum and the diverticulum as excised. The gall bladder rich as thickened and adherent, as removed.

Pathological findings. Chronic duodenitis. Mild chronic catarrhal cholecystitis.

The patient as discharged in good condition.

CASE (No. 4075). A woman, aged fifty-nine, as admitted August 1, 1930, and died August 3.

Chief complaint. Ventilating right upper quadrant pain, anorexia, loss of weight, jaundice. About three weeks previously the patient began having pain in the upper right quadrant and vomited. On one occasion, she vomited 3 gall stones, which she brought with her. She had not been able to retain much food. Her weight on admission was 70 lb., one year ago it was 80 lb.

Physical examination. A fairly well developed but poorly nourished woman. She appeared slightly toxic, chronically ill, and slightly jaundiced. The abdomen as relaxed and there as large, tender mass in the right upper quadrant.

Pre-operative diagnosis. Chronic cholecystitis and cholelithiasis.

Operation. Cholecystostomy and removal of calculi under nitrous oxide, oxygen, and ether anesthesia.

Operative findings. On opening the peritoneal cavity large mass of calcareous concretions. Mild marked degeneration of liver was observed.

Procedure. The adhesions are very well organized and very vascular and it was with difficulty that any separation could be made by lifting the vascular adhesions and cutting between them until the gall bladder as palpated.

1. Separating the gall bladder from the adhesions, it as accidentally opened and calculi are removed, but other calculi are palpated high up apparently in the liver structure but could not be removed. There as marked necrosis and oozing from the pancreas which as controlled by packing. Cholecystostomy was done.

Progress. The patient progressed satisfactorily following operation. Drainage of bile from the ood was profuse. On the twenty-fifth postoperative day the patient became cold and clammy and appeared moribund. In spite of supportive treatment, she expired on the twenty-eighth postoperative day.

Findings (A. S. Price). The specimen consisted of small portion of fatty tissue and 3 flattened calculi of mixed type ranging 1 cm. in diameter.

Diagnosis. Cholelithiasis.

CASE (No. 413). A woman, aged fifty-three was admitted April 8, 1930, and discharged May 1.

Chief complaint. Pain in the upper right quadrant. The patient stated she was entirely well until two weeks ago at which time she began having pain in the right upper quadrant requiring morphine.

Physical examination. A rather obese patient, with no rigidity or tenderness on deep pressure over gall bladder region, erythema peristaltic.

Pre-operative diagnosis. Acute cholecystitis.

Operation. Cholecystectomy closure of fistula in hepatic colon under nitrous oxide, oxygen, and ether anesthesia.

Operative findings. An incarcerated mass presented itself in the area of the gall bladder omentum, and colon. The gall bladder as not seen.

Procedure. The adhesions of the hepatic colon are separated and an abscessed, fistulous tract as found between the fundus of the gall bladder and the hepatic colon. The gall bladder was thickened and the cystic duct was enlarged, indurated, and contained a calculus. A cholecystectomy was performed and the hepatic colon as repaired with silk and an omental graft. Marston pouch was drained with dental dam drains.

Pathological findings. Subacute and chronic empyema of the gall bladder.

The patient was discharged in good condition on the twenty-ninth postoperative day.

CASE (No. 3880). A man, aged fifty-two, as admitted Dec. 9, 1930, and discharged Jan. 16, 1931.

Chief complaint. Jaundice and itching, for weeks previously there was eructation of gas, hiccups, upper abdominal pain and gradually increasing jaundice.

Physical examination. Well developed and well-nourished male. His deep jaundice not appearing acutely ill. The liver as enlarged up to the fourth interspace, the spleen was not palpable. No free fluid in the abdomen.

A roentgenographic examination of the gall bladder as made. The gall bladder as not outlined. The stomach, duodenum, and colon are normal.

Laboratory examination. Urine showed trace of albumin and bile on December 9.

Blood examination. erythrocytes—3,700,000, hemoglobin 78 per cent, leucocytes 4,350, polymorphs 76 per cent, lymphocytes 9 per cent, eosinophils 1 per cent, basophils 1 per cent. Litterin index 0.08, Van den Bergh (direct) immediate reaction, Van den Bergh (indirect) 5 units, prothrombin time prolonged, coagulability time (test) sixteen to twenty seconds, bleeding time two minutes, forty seconds.

Fragility test. Initial hemolysis 30, complete hemolysis 40.

Blood culture. No growth in seventy-two hours.

Postoperative laboratory examination. Blood sugar 93 mgm. on December 25. Gall bladder culture (Lyon drainage) showed no growth in forty-eight hours. On December 30 urine showed trace of albumin, color—turk, sediment—(Gross) crystals, acetone index 9.0, Van den Bergh (direct) immediate, Van den Bergh (indirect) 9.3 units. Coagulability time three minutes, forty seconds, bleeding time one minute thirty seconds. Prothrombin time thirteen minutes.

Stool examination. Clay colored stool, no bile present. On January 9 examination of bile revealed no crystals. From 5 to 20 leucocytes per high power field. Stool specimen for bile negative.

On January 13 the acetone index as 4. The gastrointestinal series as negative, the gall bladder as not visualized by Graham's.

Pre-operative diagnosis. Obstructive jaundice with hepatitis.

Operation. Cholecystostomy, removal of stone from and drainage of common duct.

Operative findings. On opening the peritoneum marked distention of the liver as seen. The gall bladder as not seen. There were dense adhesions between the neck of the gall bladder and ascending portion of the duodenum. With finger in the foramen of Winslow the common duct as palpated and no stones are found. It is thus true. However, when the thumb and forefinger as made last, small stone as detected at the ampulla between the finger in the foramen of Winslow and the finger over the head of the pancreas.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Pérez Fontana, V., Castiglioni Alonso, J. C., and Castiglioni Alonso, H. The Pathogenesis and Therapy of Adamantinomas. A New Surgical Procedure (Consideraciones sobre la patogenia y la terapéutica de los adamantinomas. Nuevo procedimiento quirúrgico). *An Foc de med de Montevideo*, 1940, 25: 875.

That adamantinomas develop at the site of implanted third molars is a known fact, but the presence of a molar within the nucleus of the tumor is a rare occurrence. Medical history lists only 3 such cases: one cited by Bayer in 1884, another by Hildebrand in 1893, and the third by Ollier in 1915.

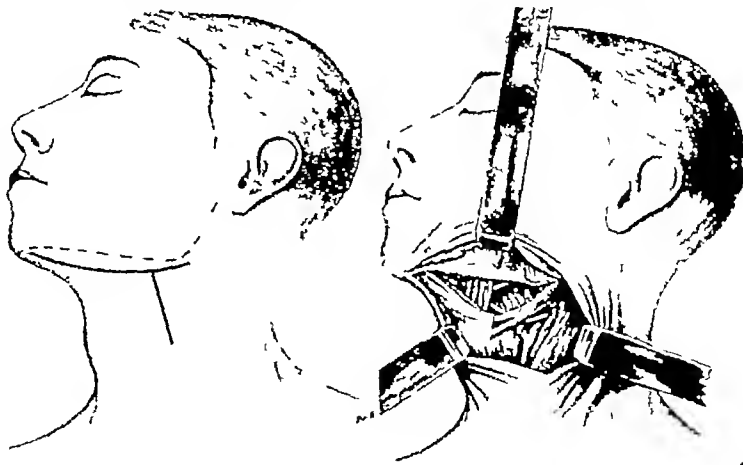
Adamantinomas present a characteristic macroscopic aspect: a tumor with honeycombed appearance, multilocular, showing cavities traversed by small trabeculae. The interior of the cavities is filled with a fluid, either serous or mucous, of yellowish or reddish color. The structure of the adamantinomas shows distinct stages of evolution, from solid to cystic forms, with intermediary mixed or semisolid, semicystic types. Histologically, adamantinomas present three types, viz. scaly, plexiform, and glandular. The stroma may be dense or slack.

In the 4 cases reported by the authors a perfect correlation existed between the histological type of the stroma and the tumorous evolution. The therapeutic means employed are both physical and surgical. Physical therapy consists of cauterization, electrocoagulation and radium. The latter, however, has been practically discarded since practice

revealed that radium does not act effectively upon the cells of adamantinomas. Electrocoagulation is recommended because its results are good. There is no relapse and neo formation of the bone is obtained, but maxillary deformation is a serious obstacle. Surgical treatment is most generally used, with either partial or total extirpation of the maxilla. The authors give a brief historical survey of the surgical methods employed.

Their own procedure is a two-stage operation. The first stage consists of local anesthesia with novocaine (1/2 per cent) and incision of the skin from the maxillary angle to the external border of the anterior ventriculus of the musculus digastricus. Perpendicularly from the middle of this incision another section of 3 cm. in length is made which reaches to the anterior border of the external cleidomastoid muscle. Extirpation of the submaxillary gland and of the ganglions of that region follows. The external carotid artery is ligated from beneath the digastric muscle. The region is then tamponated with iodiformed gauze and the skin flaps are sutured over the gauze.

The second stage comprises regional anesthesia of the inferior maxillary and lingual nerve, also anesthesia of the suprahyoid region. The neck wound is reopened, the gauze is removed, and the wound is washed carefully. The operative region is protected with warm compresses. The incisor on the affected side is extracted and the mucosa of the mouth is perforated, with a swift curve the entire contour of the bone is exposed, the lower lip being loosened and



Figs. 1 and 2 First stage of intervention

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mental exophthalmos are edematous. If proper endocrine adjustment fails to occur after thyroidectomy in human patients, the exophthalmos may continue to progress, and in the late malignant form a degenerative and fibrotic myopathy occurs which may be simulated in experimental exophthalmos by prolonged injections of thyrotropic extract.

The exophthalmos experimentally produced by injections of the extracts of the anterior lobe of the pituitary body was caused by the thyrotropic fraction. The exophthalmos developed in the refractory period following the acute thyrotoxicosis produced by the action of the thyrotropic principle on the thyroid gland and progressed slowly in an irregular manner. After several months of injection, the exophthalmos was found to persist in spite of discontinuance of the injections, narcosis, or death.

Myopathy of the extra ocular muscles was observed in the guinea pigs in which exophthalmos developed after injection of the extract. This change was sufficient to account for the degree of exophthalmos observed as well as its permanence following prolonged treatment. Other satisfactory explanations for the exophthalmos were not found. Qualitatively, the experimental myopathy was consistent with the changes found in the extra-ocular muscles of human patients afflicted with malignant exophthalmos.

LESLIE L. MCCOY, M.D.

Castroviejo, R. Keratoplasty. *Am J Ophth*, 1941, 24: 1.

The status of keratoplasty in 1932 was summarized by the author in the following conclusions:

The transplant must be taken from the same individual (autoplasty) or from individuals of the same species (homoplasty). Heterotransplants invariably become opaque.

Material can be obtained from living patients who have lesions which require enucleation, but whose corneas are normal, or from cadavers of adults or infants shortly after death. If it is possible to obtain them, eyes of young persons are more suitable for the operation.

The implant, after it has been dissected, can be preserved in dry gauze for immediate transplantation, or in different liquids, such as physiological solution of sodium chloride or hemolyzed serum, in which case it is not necessary to act so expeditiously. The sooner the transplantation is performed after the implant has been dissected from the eye, the less danger there will be of degeneration of the finer structures, such as the endothelium.

Total keratoplasty can be employed in exceptional cases when it is not possible to perform other methods of operation. This, at best, offers only temporary improvement of vision, for the implant invariably becomes opaque from secondary glaucoma or phthisis bulbi.

Lamellar keratoplasty is applicable in cases in which lesions are very superficial. Superficial lesions rarely extend over the whole surface of the cornea, when they are that extensive, they may make this

type of operation necessary for visual purposes. Usually, a less complicated operation, such as iridectomy, would serve the same purpose. The necessary proliferation of connective tissue in the place corresponding to the base of the cicatrix contributes to the formation of a certain degree of haziness of the implant which it is impossible to eliminate.

Circumscribed, penetrating keratoplasty produces the best permanent results, and is the only method that offers hope.

Scissors, forceps, and sutures traumatize the implant and favor its opacification.

Transplants must correspond exactly with the defect. It is absolutely necessary to have perfect coaptation of the edges of the transplant with the edges of the cornea of the host. This cannot be obtained by the use of knives and scissors, and requires the aid of some mechanical device which will solve the problem of size of the transplant in relation to the defect in the cornea of the host.

The trephine used to cut the full thickness of the cornea, as in the method of Von Hippel, or the superficial layers only, finishing the incision of the deeper layers with scissors, as in the method of Thomas, has solved the problem of size and form of the transplant.

The transplant must be held in position with the help of sutures. These should not be inserted in the transplant itself, but in the conjunctiva, as in the methods of Elschnig and Zirm, or with cross stitches in the cornea, as in the technique of Thomas.

When operating according to the method of Von Hippel, the pupil must be contracted fully in order to avoid injury to the lens, and it must be completely dilated when operating by the method of Thomas, to avoid anterior synechiae.

Local anesthesia is to be preferred to general anesthesia because the latter exposes the patient to postoperative vomiting, which threatens the success of the operation.

Good results have been obtained by Elschnig, with the use of a trephine of the same size for the donor and for the host, but Thomas advised the use of a slightly smaller trephine for the donor than for the host.

LESLIE L. MCCOY, M.D.

Castroviejo, R. Keratoplasty. *Am J Ophth*, 1941, 24: 139.

Corneal transplantation is a feasible and practical surgical procedure when a suitable technique is employed. The operation can be mastered by the well trained ophthalmologist, but requires a delicacy and accuracy of technique that can be attained only by practice. Before operating upon human eyes it is advisable for the surgeon to perform corneal transplantations in animals, rabbits being the most suitable. In this regard, individual adaptability to a special technique plays an important rôle. Those who have become acquainted with a certain operation may find it difficult to change to another technique which gives good results in the hands of other colleagues. As in any other field of surgery, each technique has its advantages and disadvantages,



Figs 3 and 4. Second stage from five to nine days after first stage.

the anterior muscular insertions being separated. A Gigli saw is used on the inferior maxilla near the symphysis and after protecting the lip, the operator sections the bone close to the middle line. With the extreme anterior of the sectioned maxilla displaced toward the cervical location, it is firmly grasped with a forceps and the maxilla is trepanned. Once the maxilla is separated from the muscle the mucosa of the mouth is sectioned to expose the coronoid apophysis which is sectioned from below the insertion of the temporal muscle. The maxilla, now held only by the temporomaxillary joint is grasped and the condylus is extirpated. Several blood vessels are ligated. Suture of the buccal mucosa follows, and the skin flaps are replaced and joined. A gauze drain is left at the posterior end of the incision. The oral cavity is washed daily and the nose disinfected. The drain at the neck is removed after the third day. This surgical intervention eliminates operative risks and assures satisfactory functional results.

HILDA H. WHEELER

ROUS BERGER J. L. Mixed Tumors of the Parotid Gland (Tumeurs mixtes de la parotide). *Press. med.*, Par. 240, 45 973

Rous Berger has found in his clinical experience that mixed tumors of the parotid gland often considered benign, very frequently show malignant characteristics when the patient is first seen by the surgeon. This malignancy remains localized and the satellite glands are not invaded. There are no clinical signs of the malignant change at first and often not for a long time. For this reason the author maintains that when a tumor of the parotid gland is operable radical operation should be done without biopsy. Radical operation consists in total parotidectomy not enucleation of the tumor. Enucleation is almost invariably followed by recurrence, as all malignant tissue is not removed by this procedure.

Total parotidectomy, therefore, is more difficult operation. It requires larger incision and almost

always involves some injury to the facial nerve. The lower branch of the facial nerve must usually be sacrificed; only occasionally can it be conserved. The upper branch is usually not involved. Much, however, depends on the site of the tumor; if it is situated high up, in front of the mastoid, total facial paralysis may result from the radical operation. Radical operation is necessary in mixed tumors of the parotid gland because such tumors are not radioresistive and radiotherapy is not effective.

Seven illustrative cases of tumors of the parotid gland are reported; a study of these cases shows the following facts which support the author's claim that total parotidectomy is indicated in cases of mixed tumors of the parotid gland.

Determination of the nature of the tumor may be difficult even on histological examination of few sections.

Diagnosis as to whether the capsule is invaded or not is impossible on clinical findings; there is often discrepancy between the clinical signs and the degree of malignancy of the tumor; the satellite glands are rarely invaded.

Mixed tumors, although of malignant nature develop slowly; facial paralysis is a late symptom even in carcinoma, but pain, however slight, in the region of the facial nerve is a disquieting symptom, appearing earlier than paralysis.

Radiotherapy and enucleation are found to be ineffective; they are followed by recurrence.

ALICE M. MATT

EYE

ALFRED R. B. Experimental Exophthalmos and Associated Myopathy Induced by the Thyrotropic Extract. *Arch. Ophth.* 240, 24 67

In this article the evidence suggests that exophthalmos is related to the thyrotropic hormone of the anterior lobe of the pituitary body. The pathological changes found in cases of exophthalmic goiter in man being, and the early changes found in experi-

mental exophthalmos are edematous. If proper endocrine adjustment fails to occur after thyroidectomy in human patients, the exophthalmos may continue to progress, and in the late malignant form a degenerative and fibrotic myopathy occurs which may be simulated in experimental exophthalmos by prolonged injections of thyrotropic extract.

The exophthalmos experimentally produced by injections of the extracts of the anterior lobe of the pituitary body was caused by the thyrotropic fraction. The exophthalmos developed in the refractory period following the acute thyrotoxicosis produced by the action of the thyrotropic principle on the thyroid gland and progressed slowly in an irregular manner. After several months of injection, the exophthalmos was found to persist in spite of discontinuance of the injections, narcosis, or death.

Myopathy of the extra-ocular muscles was observed in the guinea pigs in which exophthalmos developed after injection of the extract. This change was sufficient to account for the degree of exophthalmos observed as well as its permanence following prolonged treatment. Other satisfactory explanations for the exophthalmos were not found. Qualitatively, the experimental myopathy was consistent with the changes found in the extra-ocular muscles of human patients afflicted with malignant exophthalmos.

LESLIE L. MCCOY, M.D.

Castroviejo, R. Keratoplasty. *Am J Ophthalm*, 1941, 24, 1.

The status of keratoplasty in 1932 was summarized by the author in the following conclusions:

The transplant must be taken from the same individual (autoplasty) or from individuals of the same species (homoplasty). Heterotransplants invariably become opaque.

Material can be obtained from living patients who have lesions which require enucleation, but whose corneas are normal, or from cadavers of adults or infants shortly after death. If it is possible to obtain them, eyes of young persons are more suitable for the operation.

The implant, after it has been dissected, can be preserved in dry gauze for immediate transplantation, or in different liquids, such as physiological solution of sodium chloride or hemolyzed serum, in which case it is not necessary to act so expeditiously. The sooner the transplantation is performed after the implant has been dissected from the eye, the less danger there will be of degeneration of the finer structures, such as the endothelium.

Total keratoplasty can be employed in exceptional cases when it is not possible to perform other methods of operation. This, at best, offers only temporary improvement of vision, for the implant invariably becomes opaque from secondary glaucoma or phthisis bulbi.

Lamellar keratoplasty is applicable in cases in which lesions are very superficial. Superficial lesions rarely extend over the whole surface of the cornea, when they are that extensive, they may make this

type of operation necessary for visual purposes. Usually, a less complicated operation, such as iridectomy, would serve the same purpose. The necessary proliferation of connective tissue in the place corresponding to the base of the cicatrix contributes to the formation of a certain degree of haziness of the implant which it is impossible to eliminate.

Circumscribed, penetrating keratoplasty produces the best permanent results, and is the only method that offers hope.

Scissors, forceps, and sutures traumatize the implant and favor its opacification.

Transplants must correspond exactly with the defect. It is absolutely necessary to have perfect coaptation of the edges of the transplant with the edges of the cornea of the host. This cannot be obtained by the use of knives and scissors, and requires the aid of some mechanical device which will solve the problem of size of the transplant in relation to the defect in the cornea of the host.

The trephine used to cut the full thickness of the cornea, as in the method of Von Hippel, or the superficial layers only, finishing the incision of the deeper layers with scissors, as in the method of Thomas, has solved the problem of size and form of the transplant.

The transplant must be held in position with the help of sutures. These should not be inserted in the transplant itself, but in the conjunctiva, as in the methods of Elschnig and Zirm, or with cross stitches in the cornea, as in the technique of Thomas.

When operating according to the method of Von Hippel, the pupil must be contracted fully in order to avoid injury to the lens, and it must be completely dilated when operating by the method of Thomas, to avoid anterior synechiae.

Local anesthesia is to be preferred to general anesthesia because the latter exposes the patient to postoperative vomiting, which threatens the success of the operation.

Good results have been obtained by Elschnig, with the use of a trephine of the same size for the donor and for the host, but Thomas advised the use of a slightly smaller trephine for the donor than for the host.

LESLIE L. MCCOY, M.D.

Castroviejo, R. Keratoplasty. *Am J Ophthalm*, 1941, 24, 139.

Corneal transplantation is a feasible and practical surgical procedure when a suitable technique is employed. The operation can be mastered by the well trained ophthalmologist, but requires a delicacy and accuracy of technique that can be attained only by practice. Before operating upon human eyes it is advisable for the surgeon to perform corneal transplantations in animals, rabbits being the most suitable. In this regard, individual adaptability to a special technique plays an important rôle. Those who have become acquainted with a certain operation may find it difficult to change to another technique which gives good results in the hands of other colleagues. As in any other field of surgery, each technique has its advantages and disadvantages,

and it is by extensive research made by many persons that one may state which technique gives the highest percentage of good results or which is specially suited for individual cases. Of all the published techniques of partial penetrating corneal transplantation, the author believes that his method of the square corneal graft incorporates more advantages and fewer disadvantages than any other technique.

A keratoplasty will give as successful results as homokeratoplasty when the graft is obtained from the fellow eye. However, heterotransplantsations by transposition or rotation give inferior results, and should be employed only when it is impossible to obtain material for homotransplantation.

Donor material may be obtained from enucleated eyes with normal cornea, from the eyes of the still-born, from infants dying shortly after birth, and from eyes of cadavers. These eyes should be as fresh as possible to prevent autolytic changes.

The problem of preserving enucleated eyes in various solutions and in a moist chamber is discussed in detail.

Four new instruments are described only to indicate their inadequacies after clinical trial.

Lester L. McCoy, M.D.

NOSE AND SINUSES

Blichick, E. B. Diseases of the Sphenoid Sinus, with the Report of a Case of Cyst of the Sphenoid Sinus. *J. Clin. Otolaryngol.* 940, 3 03

The sphenoid sinus is the most posterior and the least accessible of the nasal accessory sinuses. The anatomical situation as well as the close proximity of the sinus to many vital and vulnerable structures, has hampered the knowledge of associated abnormalities, and has caused in many otolaryngologists well justified caution in exploration. This article concerns itself with the clinical pathology and symptomatology especially as they are related to the neighboring structures. The subject of retrobulbar neuritis is discussed and a case of cyst of the sphenoid sinus with visual complications is reported.

At birth the sphenoid sinus is only a faint depression in the cancellous tissue of the sphenoid body. At the third year it is the size of a pea and at the seventh year it can really be made out as a sinus. The sinus borders on the orbit, the optic nerve and its tracts, the third, fourth, and sixth nerves, the middle turbinate, nasal septum, ethmoid sinus, nasopharynx, carotid artery, sphenoparietal ganglion, pituitary gland, meninges, and brain.

The pathology of the sphenoid sinus concerns chiefly acute, subacute, and chronic infections, as well as osteomyelitis, neoplastic disease, and obstructions of the ostium. The normal sphenoid sinus is lined by thin, delicate epithelium, which may become much thickened and even polypoid as a result of infection. Acute purulent infection of the sphenoid sinus alone is a rare condition. Acute purulent sphenoiditis is almost invariably con-

comitant of acute purulent pansinusitis and may result in osteomyelitis and meningitis. Acute exacerbations of chronic infection are commonly encountered. Chronic sphenoid infections usually result in thickened membrane, together with fibrosis, hyperplasia, and often osteitis. Polyps may form the secretion is usually scanty. Primary neoplasms are rare. Secondary neoplastic involvement is frequent as an extension from the brain, pituitary gland, nasopharynx, and adjacent sinuses. Cysts have been reported occasionally. The clinical symptoms of sphenoid sinusitis differ from those of the remaining accessory sinuses in that the location of the pain is different, the findings on fewer the discharge is more elusive and the complications are more varied.

The pain is usually frontal, occipital, or just behind the eye. It may however be referred to the mouth at the junction of the soft palate and the anterior tonsillar pillar to the vertex or to the mastoid process. The onset of pain may be sudden or gradual. It may be dull, throbbing, or pounding, sickening, stabbing, or burning. When complications ensue there may be visual disturbances or paralysis. Cases of acute purulent infection meningitis or cavernous sinus thrombosis may result. Examination may show little of importance. If secretion is seen behind the posterior end of the middle turbinate, on the posterior end of the middle turbinate. In the sphenoid sinus recess, or around the sphenoid ostium, sphenoiditis is suggested. Roentgenograms are of material assistance in the diagnosis.

Consideration of the differential diagnosis of sphenoiditis brings one into many obscure fields—Intracranial tumors and other lesions, especially of the pituitary gland, vascular aneurysms, migraine headaches, trigeminal neuralgia, multiple sclerosis, endocrine disorders and hysteria are only a few of the more important conditions which must be differentiated from sphenoid disease.

The conservative management of sphenoid sinusitis includes dietary and prophylactic measures, the use of vitamins, especially A and B, diathermy, nasal shrinkage, nasal irrigations, suction irrigation, displacement by iodized oil or ephedrine, and measures to open the posterior nares, including partial resection of the middle turbinate and submucous resection of the nasal septum. The sphenoid sinus may be irrigated with cannula or the trepan wall may be punctured with trocars and irrigation performed through the cannula. The operative procedures are especially indicated in cases of asthma, bronchiectasis, and retrobulbar and optic neuritis. Here the operative procedures include removal of the anterior wall and perhaps the floor of the sphenoid sinus.

In discussing the background of the ophthalmologists and the otolaryngologists—that of visual disturbances due to sinusitis particularly retrobulbar neuritis and optic neuritis—it is important to differentiate these. The right of opinion to present does not favor operation on the sphenoid

sinus for retrobulbar neuritis, but in many cases optic neuritis has been shown to be due to sphenoidal sinusitis. It is the author's opinion that when the sphenoid sinus shows disease, or when no other cause can be found, optic neuritis should be an indication for sphenoidectomy. NOAH D. FABRICANT, M.D.

PHARYNX

Iglauer, S. Anatomicopathological Studies of Retropharyngeal (Peripharyngeal) Abscess. *Arch Otolaryngol*, 1941, 33, 31.

From the standpoint of anatomy, as well as from that of pathology, it seems justifiable to Iglauer to assume that a simple "retropharyngeal" abscess enters and remains localized in the peripharyngeal space. This is in accord with the clinical course of an uncomplicated abscess. Should the abscess rupture out of the peripharyngeal space, it might enter the postvisceral space and produce a true retropharyngeal abscess, on the other hand, should it perforate laterally, it might erode the carotid artery or give rise to a parapharyngeal abscess. It seems justifiable, therefore, to discontinue the use of the general term "retropharyngeal" abscess and substitute the term "Peripharyngeal" for a simple, uncomplicated abscess situated in the posterolateral wall of the pharynx (mural).

The term "retropharyngeal" should be applied to an extramural median abscess originating from the median lymph nodes or occurring in the postvisceral space following injury through the pharynx or extension from an adjacent abscess. Abscesses originating from caries of the cervical vertebrae belong in another category, namely "prevertebral abscess," situated in the prevertebral muscle space. Such a classification leads to a better understanding of the underlying pathological changes, to more accurate diagnosis, and to rational surgical procedures in the treatment of infections behind the pharynx.

Two cases of peripharyngeal abscess with gross and microscopic observations at autopsy are reported. NOAH D. FABRICANT, M.D.

Putney, F. J., and Fry, K. E. Retropharyngeal Lipoma. *Ann Otol, Rhinol & Laryngol* 1940, 49, 967.

Lipomas may develop in any part of the body where adipose tissue is located, yet their occurrence in and around the pharynx is observed very infrequently. Lipomas in this region are usually grouped as pharyngeal growths. This designation is not wholly satisfactory, for although retropharyngeal growths are found in the pharynx they originate outside of the pharyngeal cavity and mucous membrane. Retropharyngeal lipomas should therefore be classified under a separate anatomical heading from pharyngeal tumors.

The symptoms are produced by an interference with deglutition or respiration. Tumors in this locality are rarely noticed except when the symptoms become marked and the swelling is large. A

feeling of a "lump in the throat" may be the first indication of any abnormality. Dyspnea, especially in a prone position, is frequently noticed because of the bulging forward of the posterior pharyngeal wall over the aperture of the larynx. Noisy breathing while asleep is a common complaint. Speech changes such as thickness or indistinctness may be early symptoms. As the tumor increases in size, progressive dysphagia develops. Inability to propel a bolus of food beyond the pharynx, and lodgment of food at that site are noticed. Weight loss may occur from lack of sufficient nutrition and sleep.

On examination of the pharynx the interval between the soft palate and posterior pharyngeal wall is greatly diminished, and a smooth swelling of the posterior wall can be seen. The swelling appears smooth, non-ulcerated, and may be located in the midline, but more often predominates on one side. The enlargement may extend from the nasopharynx to the hypopharynx, and a view of the larynx is often obscured by the overhanging mass. On palpation the tumor is moderately firm and compressible. When the tumor is large there is usually a mass present in the neck, more commonly unilateral, with an indefinite outline and of soft consistency. Lobulations can rarely be distinguished.

Retropharyngeal lipoma must be differentiated from a malignant tumor or abscess in this locality. Treatment is surgical extirpation, preferably by an approach through the neck. The technique of removal is relatively easy because the mass is sharply defined from the surrounding tissue and shells out readily. An incision along the anterior border of the sternomastoid muscle provides adequate exposure. The tumor may extend from the base of the skull to the apex of the lung and may lie in close approximation to the carotid sheath. It is not necessary to ligate the external carotid artery preliminary to operation. The danger of severe hemorrhage is remote if the incision affords a view of the important structures in the neck.

Although a larger number of lipomas of the pharynx have been reported, only 15 cases could be found in the literature, to which 2 cases are added by the authors. NOAH D. FABRICANT, M.D.

NECK

Scarcello, N. S., and Goodale, R. H. Struma Lymphomatosa. *New England J Med*, 1941, 224, 60.

Struma lymphomatosa is a lymphoid goiter, it was first described by Hashimoto in 1912. Hashimoto considered this disease a separate entity, not to be confused with Riedel's disease, the essential clinical feature of which is a widespread involvement of the extrathyroid tissues in a diffuse sclerosis apparently originating in part of the thyroid gland.

Ewing, in 1922, came to the conclusion that Hashimoto had described the earlier stages, and Riedel the later stages of the same disease. A survey of the literature reveals that while many authors hold

to this view numerous others have expressed the opinion that the diseases are distinct entities. The present evidence would appear to support the latter idea.

The cause of these diseases remains unknown, and there is some difference of opinion as to whether or not the cases can be diagnosed clinically. Characteristic findings of Hashimoto's struma are its preponderance in women of from forty-five to sixty years of age, tendency toward myxedema, involvement of all parts of the thyroid but nothing outside of it, the absence of nodularity or hardness of the goiter, mild pressure effects and its characteristic histological structure. The diagnostic features of Riedel's disease are its occurrence in young men and women, the little tendency to and myxedema, unilateral involvement, extension to the extrathyroidal structures, the intensely hard goiter, great pressure effects and the dense scar tissue as seen histologically.

Surgical intervention in cases of struma lymphomatosa is contraindicated, especially in the cases associated with hypothyroidism. In cases of hyperthyroidism only enough gland should be removed to relieve the pressure symptoms or to establish diagnosis, thus ruling out cancer. Basal metabolic rates should be determined frequently and whenever signs of hypothyroidism are evident, thyroid medication should be instituted. Good results have been reported with ray and radium therapy.

A case of Hashimoto's disease occurring in young woman twenty-six years of age with symptoms of hyperthyroidism is reported. Following subtotal thyroidectomy the patient developed progressive myxedema of increasing severity. She was followed up clinically until her death, thirteen years later. At that time thyroid tissue obtained at autopsy was compared with that removed at operation. It is practically identical histological findings.

S. LEON TETELBA, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS, CRANIAL NERVES

Munro, D., and Maltbig, G. L. Extradural Hemorrhage *Ann Surg*, 1941, 113, 192

With an experience based on 44 cases of extradural hemorrhage, the authors believe that the "classical" description of such a lesion—initial loss of consciousness, lucid interval, secondary unconsciousness, clear cerebrospinal fluid—is usually wrong and misleading in actual practice.

While the cause of such a lesion is trauma to the head, such hematomas are yet a rare complication of such trauma, occurring in only 3 per cent of their cases of such injury. The bleeding is either arterial or venous, frequently the latter, contrary to popular belief. A unilateral dilated pupil is not always present, but when it is it may usually be taken to indicate an ipsilateral clot. The authors would consider the history of the accident of equal or greater importance than most of the resulting neurological signs, many of which are shifting and unreliable. Extradural hematoma is to be differentiated from cerebral laceration and contusion, localized cerebral edema, subdural hematoma, depressed skull fracture, and intracerebral hematoma, but actual diagnostic exploratory trephination may be necessary to establish a correct diagnosis.

Treatment consists of making a craniectomy in the temporal bone large enough to remove the clot and allow accurate control of the bleeding vessels. These should be clipped or tied, not coagulated. The dura is then opened widely to allow for cerebral decompression and the wound is closed with rubber drains in place. Lumbar punctures and judicious dehydration methods are used postoperatively to control intracranial pressure increases. Patients with extradural hemorrhage require immediate care, close teamwork on the part of everyone in the operating room, and intelligent after care. Under the best of circumstances they are in an extremely critical condition and all too often the outcome is fatal.

JOHN MARTIN, M.D.

Poe, D. L. Sphenotemporal Lobe Abscess with an Analysis of Little Known Clinical Symptoms *Laryngoscope*, 1941, 51, 87

This presentation of a case of sphenotemporal lobe abscess emphasizes the following highlights of consideration to establish the side and site of operation. The patient was a ten year old boy with a history of bilateral otitis media of six years' duration. Deep coma had been present for fourteen hours. The pupils were irregular and dilated, with the left larger and fixed. Two diopters of choking of the right optic nerve head and four diopters of choking of the left, with hemorrhage on the left disc, were found. There was bilateral spasticity, with a ques-

tionable Babinski sign. Drowsiness and sensory aphasia indicated that this was a case of sphenotemporal-lobe abscess secondary to chronic otitis media on the dominant side of the brain, which in this right-handed boy was on the left side.

At operation (mastoidectomy) there was no avenue of infection visible extending from the surgically exposed area to the brain. With exposure of the middle and posterior cranial fossæ, there was evidence of increased intracranial pressure, but of no other pathology. Palpation gave the impression of a deep, fluctuating mass. A needle passed 4.5 cm. toward the inferior ventricular horn evacuated 46 c.c. of purulent fluid. A Mosher basket drain was introduced and packed with gauze which was changed frequently. The Mosher basket was removed after thirty-five days. Recovery was uneventful. Cultural examination showed the streptococcus hemolyticus.

Experimental, clinical, and pathological evidence corroborates Marburg, Takase, and Anglade in their notation that the temporal lobes are the seat of or are concerned with emotions or "affective tonus." The symptoms that we may expect as a result of serious injury to the temporal lobe on the dominant side of the brain occur because of damaged uncus, hippocampus, optic radiations, and Wernicke and Gerstmann areas. The symptoms resulting from impairment of each of these areas are described in detail. They may occur in various degrees of intensity or in many combinations.

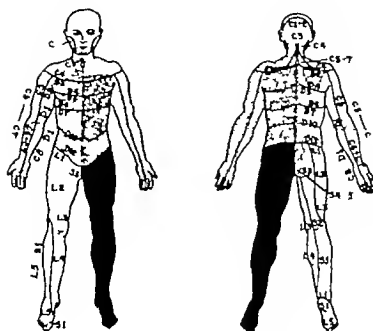
The best results of surgical interference in brain abscess are achieved after encapsulation occurs. The two chief problems in treating brain abscess are the diagnosis of the abscess and the decision of when to operate.

JOHN L. LINQUIST, M.D.

Schwartz, H. G., and O'Leary, J. L. Section of the Spinothalamic Tract in the Medulla with Observations on the Pathway for Pain *Surgery*, 1941, 9, 183

Schwartz sectioned the spinothalamic tract at the junction of the middle and lower thirds of the inferior olive for relief of intractable pain. Careful sensory examination was recorded prior to operation. During operation the sensory changes which occurred in different parts of the body were correlated with the increasing depths of incision. Observations were also made upon partial section of the descending spinal tract of the trigeminal nerve. The operative technique is described. The patient expired on the second postoperative day, and autopsy with detailed study of the brain was made. The diagram (Fig. 1) illustrates the sensory changes. Outline drawings illustrate the extent of the surgical lesions in the right spinothalamic tract.

There was evidence that the mandibular fibers of the trigeminal nerve were injured. The observations



■ Complete analgesia and loss of tickling sensation.
Blunt touch preserved

▨ Almost complete analgesia and loss of tickling sensation.

□ Hypalgesia and diminished tickling.

Fig. 1. Illustrates the results of the postoperative sensory examination, which was checked repeatedly.

here support the premise that in the brain stem, as in the cord, fibers from the lower dermatomes lie dorsolaterally while those from the upper segment lie ventromedially.

JOSEF L. LUDWIG, M.D.

Zivkovic, V. A New Surgical Treatment for Trigeminal Neuralgia (Lina neue chirurgische Methode bei Trigeminusneuralgie). *Monatsschrift für Chirurgie* 94, 37.

A short historical review is given concerning the various forms of treatment of trigeminal neuralgia from the peripheral alcohol injection of Pitres and Verzar, the peripheral branch resection of Hartley and Haertl, type of alcohol injection of the operation of Frazer and Spiller, Dandy's method of sectioning the sensory root of the trigeminal nerve close to the brain stem and, essentially, from that of Frazer only in the matter of anatomical approach.

I. Olivecrona, clin. Stockholm, they have become convinced that the pain-bearing fibers come from the bulbospinal tract and on the basis of this fact Spjut and myself have decided on sectioning the tract, thus the brain stem. The first operation of this type was done in 1931 and by 1937 operations had been done by this method. Before each operation a careful study of facial sensation is necessary for each purpose. This particular study, both sides of the face, are snapped into square millimeters by special measuring device. Each square is then tested for sensation and the result is accurately recorded. The operation is done under partial and part general anesthesia. A small incision from 6 to 8 cm long is made in the suboccipital region on the involved side. Removal of the arch of the atlas is not necessary. The cerebellum is retracted and the cerebellum is retracted so that the occipital artery is visible. The occipital artery is retracted so that the occipital artery is visible. The occipital artery is retracted so that the occipital artery is visible.

gether with the tenth, eleventh, and twelfth nerves. The section of the tract should be made in the plane between the upper and lower halves of the olive. The cut is from 3 to 4 mm long and from 3 to 3.5 mm deep.

Possible complications are injury to the vagus, with paralysis of the recurrent nerve. Only 2 cases resulted in failure, probably because the tract was not accurately sectioned, and these were later treated successfully by the Frazier type of operation.

(LAVRIC) JOHN MARTIN, M D

PERIPHERAL NERVES

Kraus, H., and Reisner, H. Results of Treatment of Peripheral Nerve Wounds with Particular Consideration of the Gunshot Wounds of the Years 1919, 1927, and 1934 (*Behandlungsergebnisse von Verletzungen peripherer Nerven mit besonderer Berücksichtigung der Schussverletzungen der Jahre 1919, 1927 und 1934*). *Arch f klin Chir*, 1940, 199: 318.

The authors report on an investigation of 66 cases of treated peripheral nerve injuries for the years from 1927 to 1938. Of these, 40 were operated upon primarily and 10, secondarily. Nerve sutures were accomplished bloodlessly, usually under local anesthesia, and only the finest of silk suture material was used. In the cases of incomplete section of the nerve, suture was done in the same general way. In compounded fractures the nerve suture was done during wound repair, but in closed or non-compounded fractures the necessary nerve sutures were postponed until healing of the fractures. Neurolysis was done perineurally, never endoneurally.

In injuries of the radial nerve both movement and sensation were restored, movement was best restored in the median nerve, sensation in the ulnar nerve. Perineural suture gave good results in the incomplete nerve sections. An especially impressive case of laceration of the median and ulnar nerves at the elbow, with excellent healing results, is reported. In cases in which mobility had been restored fatigue was experienced easily. Only in a minor percentage

of the cases was a loss of dissociated sensory perception confirmed, although disturbances of temperature perception were usually somewhat more widespread than those of touch and pain. The state of the weather always exerted a strong influence on the production of unpleasant sensations (paresthesias). Trophic disturbances were rare, they were more commonly seen with concurrent arterial damage. So far as healing expectations are concerned, multiple nerve injuries, especially those of the median and ulnar nerves, are as favorable as single injuries. Wound infection does not adversely influence healing expectation to any great degree. Secondary nerve suture does not give so good a result as does primary suture, especially if there is quite a long time intervening before suture is finally accomplished. Also, secondary suture is much more frequently attended by eventual vasomotor-trophic disturbances. The earlier intervention occurred the better result was obtained from neurolysis, and the results were especially good in the cases of radial palsy following fracture of the humerus. They would have been still better had endoneurolysis been done in the cases with edema of the radial nerve. Trophic disturbances remained in 41 per cent of the cases examined.

One cannot doubt the value of electrophysical after care, and the maintenance of motion of the joint and avoidance of contractures appear to be of greatest importance. Sixteen cases which were treated conservatively, and approximately 75 per cent of the cases given electrophysical after care, showed a 75 per cent recovery and a 25 per cent improvement, except for the cases of peroneal paralysis, in which the results of treatment are always difficult to evaluate. Of 19 gunshot nerve injuries, 11 were treated operatively, 3 of them being operated upon twice. The results in gunshot wounds are more unfavorable than those in the usual open wounds, presumably because suppuration persists for a longer time. Therefore, in such cases primary suture must be avoided. In such wounds also the sciatic and peroneal nerves show the poorest results.

(MAX BUDDE) JOHN MARTIN, M D

SURGERY OF THE THORAX

CHEST WALL AND BREAST

POU ORTLE, J. Mastopathies and Benign Tumors of the Breast; Treatment (Mastopathies y tumores mamarios benignos. Conducta quirúrgica). *Boletín Oficial Liga Argentina contra el Cáncer* 1939, 4, 6

In the pathology of the breast there are two kinds of disease to be considered—the functional and organic. The best treatment for the former group is hormone treatment with ovarian extract as the leading component and extract of the anterior lobe of the hypophysis and thyroid extract supplements.

In chronic cystic mastopathy hormone therapy may be tried, but the treatment of choice is partial or total mastectomy according to the findings in the case. The possibility of malignant degeneration must be borne in mind in chronic cystic mastopathy. The best preventive of such degeneration is partial or total mastectomy.

If possible, a differentiation should be made between benign and malignant tumors of the breast but there is no definite line of demarcation between benignity and malignancy. Sometimes the differentiation can be made comparatively easily by clinical examination alone and sometimes it can hardly be made without the aid of the most careful histological examination. Clinical diagnosis should, however, always be supplemented by histological examination. In cases that are doubtful clinically biopsy should be made during the operation.

Sometimes there are histological forms intermediate between benign and malignant pictures in which the prognosis is doubtful. In the breast these forms are particularly important. There are also cases in which benign and malignant forms are combined.

The diagnosis the surgeon should collaborate with the histologist and carefully weigh the clinical data and the results of histological examination based on sufficient biopsy material.

In benign lesions of the breast roentgen treatment is indicated if the patient refuses operation or if operation involves particularly serious risks. As a general rule, surgery must be preferred when possible. For the extirpation of benign tumors four types of incision are to be recommended: perimammary, supra-internal, periareolar and nipple-beechnav transverse.

As a general rule circumscribed cystic mastopathies and fibro-adenomas of the breast should be treated by partial mastectomy; diffuse cystic mastopathies by total mastectomy; and intracanalicular papillomas by simple local extirpation of the affected duct.

ALBERT G. MORGAN, M.D.

EGGERS, C., DeCholnoky, T. and Jessup, D. E. D. Cancer of the Breast. *Ann Surg* 94, 3, 1

A analysis of 55 cases of breast cancer is presented from the Medical Cancer Unit of the New

York Post-Graduate Hospital. One hundred and eleven of the patients, or 2 per cent, had metastases which were internal or were irreparable and, therefore, were inoperable. Three hundred and sixty-four were considered operable. Of these 16 or 3 per cent, came for consultation only leaving 278 or 55 per cent, upon whom this report is based.

Preliminary excision of the tumor is advised in radical operations to avoid manipulation of the growth and the spread of cancer cells during operation.

By means of the tests at our disposal for judging the efficacy of the radical operation for cancer of the breast—longevity and local recurrence—we may conclude that a carefully performed operation is successful in curing the disease locally.

Complications and sequelae are presented under the different headings of bilateral involvement, supraclavicular involvement, the significance of bleeding from the nipple and other discharges, ulcerated breast carcinoma, local recurrence and chronic edema of the arm. Cases with serous and other discharges may be regarded as probably benign and treatment for relief instituted. They should, however, be kept under observation. Knowing that a large percentage of patients with bleeding nipples has carcinoma, if clinical significance should be stressed. If the bleeding persists it is important that some operative procedure be employed to determine the source of the bleeding. A simple ablation may be indicated.

Five-year arrest of the disease as obtained in 53.6 per cent of the cases without lymph node involvement and 50 per cent of those with lymph node involvement. Ten-year arrest as obtained in 36 per cent of the cases without lymph node involvement, and in 33 per cent of those with lymph node involvement. These cases, though they show a relatively low percentage of cures, give quite favorable statistics when viewed in the light of the poor clinical condition of the patients, and the fact that they were operated upon by 54 different surgeons.

JOSEPH K. NARAT, M.D.

PECK, W. S., Ransom, H. K., and Hodges, F. J. Treatment of Advanced and Recurrent Carcinoma of the Breast. *Am J Roentgenol* 940, 44, 866

This article is devoted largely to the consideration of the treatment of patients afflicted with incurable mammary carcinoma. Cases in which the extent of the lesion, the presence of distant metastases or other causes contraindicate surgery irradiation is usually the only feasible method of treatment and prolongation of life and alleviation of suffering are ordinarily all that can be expected from it. With new views toward emphasizing the importance of providing care in such cases, the authors have re-

viewed the case records of 920 consecutive patients admitted to the University Hospital from 1931 to 1938. Only palliative treatment could be offered to 430 of this number when they were first seen.

In dealing with cases of advanced carcinoma of the breast the procedures of choice as determined in Neoplasm Conferences based upon the clinical experience provided by the group of patients under consideration are presented in detail. For purposes of discussion the lesions are classified and tabulated as follows:

- 1 Local lesions (untreated)
 - a Breast contains multiple carcinomatous masses (inoperable)
 - b "Inflammatory type" of carcinoma
 - c Slowly growing carcinoma with contraction of breast
 - d Ulcerating carcinoma
 - c Bilateral carcinomatous involvement of the breasts
- 2 Axillary and supraclavicular metastases (untreated)
 - a Large but movable axillary metastases
 - b Fixed axillary metastases
 - c Supraclavicular metastases
- 3 Remote metastases
 - a Metastatic lesions in bone
 - b Pulmonary, liver, and other remote metastases
- 4 Local recurrences
 - a Postoperative
 - (1) Multiple subcutaneous nodules
 - (2) Recurrences in the scar
 - (3) "Inflammatory type" of recurrence in the chest wall
 - b Postirradiation

The preferable procedures in connection with each of the conditions mentioned are indicated. Consideration is also given to castration by irradiation if the patient is menstruating. Among the conclusions reached it is stated that irradiation is the most effective single agent in dealing with advanced and recurrent breast cancer. ADOLPH HARTUNG, M.D.

TRACHEA, LUNGS, AND PLEURA

Nicolosi, G. New Orientations in the Treatment of Thoracopulmonary Injuries (Nuovi orientamenti nella terapia delle ferite toraco-polmonari). *Po'iclin* Rome, 1940 47 sez. chir. 305

Perforating wounds of the chest with injuries of the lungs should, in Nicolosi's opinion, be treated conservatively unless a surgical intervention is indicated by special complications.

It is important to immobilize the damaged lung which can be done completely with artificial pneumothorax. However this is impracticable or dangerous if pleural adhesions exist if the other lung is infected or injured or if the wound channel extends into the extrathoracic parts.

Latter in 1937 introduced alcoholization of the intercostal nerves. The correspondent parts of the

thorax are hereby immobilized, and the movements of the lung, though not fully prevented, are sufficiently reduced to facilitate the fixing of the edges of the wound, as well as the stopping of the hemorrhage. Pneumothorax certainly has a more radical instantaneous effect but no one can predict how long it will last in the individual case. Sometimes it is absorbed rapidly, and upon the expansion of the lung the wound may again be torn open. The immobility of the thorax produced by alcoholization, however, lasts at least three months. Moreover, the alcoholization can be executed on both sides at the same time.

Immediately after the alcoholization the pain recedes and respiration is easier, soon the actual bleeding stops, and secondary bleeding is prevented.

The removal of the hemothorax is generally not advisable because the latter tamponades the bleeding lung. Of course if the hematoma is large enough to disturb the respiration to a great extent, it has to be partially emptied. The desirable slow absorption of the hemothorax is facilitated rather than hampered by alcoholization.

A pneumothorax caused by the injury itself has to be emptied only in case of pleural adhesions with the danger of embolism or hemorrhage.

The development of a deleterious universal emphysema will be prevented by alcoholization. Paralyzing of the intercostal nerves is the ideal treatment for fractures of the ribs.

From 5 to 9 single nerves can be alcoholized in one stage.

Many soldiers with perforating wounds of the chest bleed to death while being transported. It is impossible to have the necessary apparatus for applying a pneumothorax everywhere behind the front line, but it is possible everywhere to resort to intercostal alcoholization by means of a common syringe, a usual anesthetic and a little alcohol.

NELDA CASSUTO

Ross, J. M. Hemorrhage Into the Lungs in Cases of Death Due to Trauma. *Brit. M. J.*, 1941, 1: 70

In this paper, based on post-mortem examination of many cases of chest injury, a comparison is made between peace time and war time injuries. To a large extent war-time injuries of the chest and lungs caused by flying missiles, impact damage, compression, and asphyxia when bodies are buried under debris are comparable to peace time injuries of the chest sustained by automobile accident victims or industrial cases. However, during this war a new clinical entity has emerged which may well be called "hemorrhagic pulmonary concussion" with minor or absent injury to the chest wall. These cases are due to the proximity of the patient to detonation of high explosive shells. The salient post-mortem feature is extensive bilateral intrapulmonary hemorrhage, which is widespread and consists of intense capillary congestion with bleeding into the walls of the small bronchioles and distention of the air vesicles and respiratory bronchioles. There is usually

no clotting of the blood and in most cases the patients have died within two or three days.

J. E. T. EMERY, M.D.

Palao, J. R. Studies in the Experimental Production of Pulmonary Emphysema. *J. Thoracic Surg.* 1940, 10, 30

The author reviews the many theories in regard to the development of pulmonary emphysema and the experimental work that has been done. It is evident that emphysema can be produced by (1) some type of obstruction to the passage of air through the tracheobronchial tree (2) increase in the space occupied by the functioning lung tissue and (3) decrease in oxygen tension of the air breathed.

The author inserted into the trachea of dogs valve-like mechanism which obstructed inspiration and in other dogs mechanism which obstructed expiration, and in series of controls he inserted mechanism without the valve so that neither expiration nor inspiration was obstructed.

He also conducted experiments on dogs in which the thoracic cage was enlarged by removal of the costal cartilages or by reeving of the diaphragm.

His results showed that expiratory obstruction produced the gross and microscopic changes of emphysema, and that inspiratory obstruction produced emphysema.

The operation of removing costal cartilages was not successful in enlarging the thoracic cage, but the operation of reeving the diaphragm did increase the thoracic capacity and the animals so treated developed the gross and histological evidence of emphysema.

JULIA A. MOORE, M.D.

Dubré, R., Lamy, M. and Marie J. Congenital Air Cyst of the Lung and Emphysema from Bronchial Obstruction in Children (*Kystes gazeux congénitaux du poumon et emphysema par obstruction bronchique chez l'enfant*). *Presse méd. Par.* 1940, 43, 93

The authors state that congenital cysts of the lung were formerly believed to be extremely rare and incompatible with life but it has recently been shown that this condition occurs more often than is commonly realized and that it can be present for many years. Congenital air cyst of the lung is now a well known clinical entity. Emphysema from bronchial obstruction, although known to the anatomopathologist since Laennec, time is less frequently recognized by the clinician. These two conditions are seen as intrapulmonary gas pockets both by the radiologist and the clinician, which makes the differential diagnosis extremely difficult. On the basis of their recent studies the authors are of the opinion that these two conditions have been frequently confused clinically and congenital lung cysts has sometimes been erroneously diagnosed as emphysema from bronchial obstruction.

In this article the authors attempt to differentiate between the two diseases. Severe degrees in the most characteristic clinical features of congenital cysts

of the lung occurring in infancy is several weeks of age. Physical signs are similar to those of pneumothorax. If the cyst is large and include exaggerated breathing, absence of breath sounds, and displacement of the heart and mediastinum toward the uninvolved side. Radiography of large cysts reveals an image similar to pneumothorax on superficial examination. However, on closer inspection the picture is suggestive of cyst: there is no hazy shadow even after decompression and the contours of the gaseous cavity are finely outlined along the diaphragm, heart and borders of the mediastinum. Solitary cysts of smaller size are round and regular and may be more easily outlined by partial filling with an opaque fluid. Multiple cysts appear as a series of cavities juxtaposed or oval, occupying part of one or both lungs. These cysts may remain unchanged for a long time. However it is possible for the cyst to open into a large bronchus or into the pleural cavity; several cysts might fuse into a large sac; there might be an intracystic hemorrhage manifested by consequent hemoptysis, or the cyst might suppurate.

Emphysema following bronchial obstruction may be caused by foreign body or by an endobronchial or extrinsic tumor as in carcinoma or adenopathy. The etiology can be determined by clinical study, roentgenography and lipiodol examination and bronchoscopy. Complete obstruction is associated with atelectasis. If the obstruction occurs at large bronchus or a lobar bronchus, the condition affects the corresponding pulmonary lobes and is known as lobar emphysema. When the obstruction occurs at small bronchus, the emphysema is limited and forms a kind of bubble in the pulmonary parenchyma. The authors call this bullous emphysema.

In lobar emphysema the most constant symptom is dyspnea continuous or paroxysmal in character occurring as single attack or in repeated attacks. Physical signs are those of pneumothorax. Radiography reveals exaggerated transparency of the affected lobe, an increase in the surface of the lobe, lowering and partial fixation of the diaphragmatic sac, and an exaggerated excursion of the diaphragm on the healthy side. The heart and mediastinum are attracted to the uninvolved side during expiration. Radiography may also indicate the cause of obstruction. Lipiodol instillation of the bronchus usually indicates an arrest at the level of obstruction. Bronchoscopy, informative of the site of the bronchi, indicates the obstacle and is suggestive of the type of therapy to be instituted.

Bullous emphysema appears in the pulmonary parenchyma as large clear bubble but is smaller than the voluminous lobar emphysema. The cause of bronchial obliteration may be foreign body, ganglion mass, or inflammatory lesion of the bronchial canal. It usually occurs as a complication of an acute pneumopathy. There is rarely any evidence of cavitation or partial pneumothorax. The lesions revealed only by roentgenography as clear round regular or polylobular bubble with definite contour. The bulla appears either in the

interior or in the vicinity of the opaque focus of the primary pulmonary lesion. The area rarely increases in size and usually there is rapid disappearance following elimination of the obstructing bronchial secretions.

The authors emphasize the frequent difficulty in differentiating between congenital air cysts and bullous emphysema of the lung. In discussing the distinguishing characteristics they stress the necessity of considering the onset, clinical course, and the possibility of bronchial obstruction. They conclude that by careful study one can distinguish air cyst of the lung, a congenital developmental abnormality, from emphysema due to obstruction (both lobar and bullous), a more or less transient mechanical difficulty of air circulation in the lung.

MICHAEL DEBAKEY, M D

Lieberman, L M, Hodes, P J, and Leopold, S S.
Roentgen Therapy of Experimental Lobar
Pneumonia in Dogs. *Am J M Sc*, 1941, 201: 92

The authors have reviewed the published reports of the use of roentgen therapy in acute and unresolved pneumonia. They have also reviewed the literature in regard to the mechanism of the effects of irradiation in inflammatory conditions. They observed that the roentgen therapy of lobar pneumonia had little background of animal investigation and believed that experimental studies should be made if the method were to be satisfactorily evaluated.

Lobar pneumonia was produced in anesthetized dogs by the introduction of 1 cc of potato starch paste containing 0.06 cc of sedimented, virulent pneumococci, into the bronchus of the lower lobe of the lung desired. Experimental pneumonia was induced in 45 dogs, 26 of which were treated with roentgen rays and 19 of which served as controls. None of the control animals in this series survived. Blood stream invasion occurred in 5 of the 25 dogs in which blood cultures were taken. The treated dogs were divided into three groups. The dogs in Group 1 were treated with rays generated at 80 kv and 5 ma, filtered through 5 mm of aluminum at a TSD of 30 cm. A 20 by 20 cm portal was directed laterally into the affected lung. In this group there were 10 irradiated and 10 control animals. All of these dogs died, the period of survival in the control series being three and four-tenths days, that in the treated series, four and five-tenths days.

Group 2 consisted of 4 animals, 3 of which were treated with roentgen rays generated at 135 kv and 8 ma, filtered through 0.25 mm of copper and 1 mm of aluminum at a TSD of 30 mm. One of the treated animals recovered.

The 13 irradiated dogs in Group 3 were treated with rays generated at 200 kv and 20 ma, filtered through 0.5 mm of copper and 1 mm of aluminum at a TSD of 50 cm, the portal, 20 by 20 cm, being directed laterally into the affected lung. There were 8 control animals in this series. Three of the controls and 5 of the treated dogs had positive blood

cultures. The average survival period in the control series was two and one-tenth days. The average survival period in the irradiated animals which died was eight and five-tenths days. Five of the treated animals survived.

The microscopic appearance of the lung was studied and it was found that the degree of congestion and hemorrhage was essentially the same in the irradiated animals as in the controls. Edema and atelectasis were less marked in the irradiated group. There was a relative increase in round-cell infiltration associated with a decrease in the neutrophils. In general, the pneumonic process in the treated animals seemed to have progressed beyond the acute stage which characterized the control group.

The authors believe that their results justify the conclusion that when sufficient dosage of irradiation is used in the treatment of experimental lobar pneumonia in dogs there is definite evidence of a trend toward survival.

HAROLD C OCHSNER, M D

Rolland, J, and Tsoutis, N G. Curative Action of Partial Thoracoplasties of the Apex on Purulent Effusions Resulting from Ineffective Pneumothorax (Effet curateur sur les épanchements purulents des pneumothorax inefficaces, des thoracoplasties partielles du sommet). *Presse méd*, Par, 1940, 48: 922

The inefficacy of a pneumothorax is proved by the persistence of expectoration containing bacilli, in spite of the collapse of the lung. The first thing to do is to determine whether there is any infection on the other side that is keeping up the expectoration. If not, in all probability the expectoration is caused by the presence of adhesive bands. Of course, the only effective way of treating the complications of pneumothorax is to prevent them, and now, with the Jacobæus method, there is no longer any excuse for an ineffective pneumothorax.

However, if a pneumothorax proves ineffective, or not sufficiently effective, an early pleuroscopy should be carried out, and if it shows that the pneumothorax cannot be improved upon there should be no hesitation in performing operation.

Two cases are described in which an ineffective pneumothorax was treated surgically. In the first case there was an excavated lesion of the upper lobe adherent to the apex. In the second there was a small cavity in a stump of lung that was flattened in a band against the mediastinum. Both patients had expectoration containing bacilli and in both cases there was purulent effusion which reformed quickly after evacuation. In the first case a partial upper thoracoplasty was performed with resection of the posterior arches of the first four ribs near the transverse processes, the operation was performed in one stage. In the second case vertebral disarticulation of the first four ribs was performed with resection of the transverse processes, also in one stage. The author emphasizes the value of the latter operation, which has been condemned as useless and dangerous.

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J. E. TERMAN, M.D.

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The author reviews the many theories in regard to the development of pulmonary emphysema and the experimental work that has been done. It is evident that emphysema can be produced by (1) some type of obstruction to the passage of air through the tracheobronchial tree (2) increase in the space occupied by functioning lung tissue and (3) decrease in oxygen tension of the air breathed.

The author inserted into the trachea of dogs valve-like mechanism which obstructed inspiration and in other dogs mechanism which obstructed expiration, and in a series of control he inserted mechanism without the valve so that neither expiration nor inspiration was obstructed.

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JEROME A. MOHR, M.D.

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These authors believe that congenital cysts of the lung are formerly believed to be extremely rare and incompatible with life but it has recently been shown that this condition occurs more often than is commonly realized and that it can be present for many years. Congenital cyst of the lung is now a well known clinical entity. Emphysema from bronchial obstruction, although known to the anatomopathologist since Laënnec's time, is less frequently recognized by the clinician. These two conditions are seen as intrapulmonary gas pockets both by the radiologist and the clinician, which makes the differential diagnosis extremely difficult. On the basis of their recent studies the authors are of the opinion that these two conditions have been frequently confused clinically and congenital lung cyst has sometimes been erroneously diagnosed as emphysema from bronchial obstruction.

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of the lung occurring in infants several weeks of age. Physical signs are similar to those of pneumothorax. If the cyst is large and includes exaggerated breathing, absence of breath sounds, and displacement of the heart and mediastinum toward the involved side. Radiography of large cysts reveals an image similar to pneumothorax on superficial examination. However, on closer inspection the picture is suggestive of cyst; there is no bluish shadow even after decompression and the contours of the gasous cavity are finely outlined along the diaphragm, heart, and borders of the mediastinum. Solitary cysts of smaller size are round and regular and may be more easily outlined by partial filling with an opaque fluid. Multiple cysts appear as series of cavities juxtaposed or oval, occupying part of one or both lungs. These cysts may remain unchanged for long time. However, it is possible for the cyst to open into large bronchus or into the pleural cavity. Several cysts might fuse into large sac, there might be an intracystic hemorrhage manifested by consequent hemoptysis, or the cyst might suppurate.

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Partial Thoracoplasties of the Apex on Purulent Effusions Resulting from Ineffective Pneumothorax (Effet curateur sur les épanchements purulents des pneumothorax inefficaces, des thoracoplasties partielles du sommet). *Presse méd*, Par, 1940, 48, 922.

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However, if a pneumothorax proves ineffective, or not sufficiently effective, an early pleuroscopy should be carried out, and if it shows that the pneumothorax cannot be improved upon there should be no hesitation in performing operation.

Two cases are described in which an ineffective pneumothorax was treated surgically. In the first case there was an excavated lesion of the upper lobe adherent to the apex. In the second there was a small cavity in a stump of lung that was flattened in a band against the mediastinum. Both patients had expectoration containing bacilli and in both cases there was purulent effusion which reformed quickly after evacuation. In the first case a partial upper thoracoplasty was performed with resection of the posterior arches of the first four ribs near the transverse processes, the operation was performed in one stage. In the second case vertebral disarticulation of the first four ribs was performed with resection of the transverse processes, also in one stage. The author emphasizes the value of the latter operation, which has been condemned as useless and dangerous.

by some operators. He points out that there is no such thing as a standard rib resection each operation should be made to fit the case, as dress is cut to fit the wearer.

In both cases the lesions collapsed and the bacilli disappeared, as was to be expected, but surprisingly enough, the effusions became serous and then topped also.

These cases show that the purulent pleurisy, practically always tuberculous, which develops in ineffective pneumothorax comes from a lesion in the lung that is being pulled on by the adhesive band. An amount of draining of the pleura will do a good deal as the effusion is being kept up by the unhealed lung lesion. Pleurotomy could have condemned these patients to prolonged if not perpetual drainage. The only logical treatment is to collapse the affected lung.

A. DEER G. MONTAGNA M.D.

Hall W. G. The Origin of Tumors Occurring in the Apex of the Lung. *Am J Roentgenol* 940, 41 1935

In 94 Pancoast reported 3 apical lung tumors. In 93 when he reviewed these cases and 4 more he gave them the name "superior pulmonary sarcoma" but later laid down 5 criteria for the diagnosis of this tumor. These are: (1) location at the thoracic inlet; (2) roentgen demonstration of small homogeneous shadow in the pulmonary apex; (3) pain in the shoulder often radiating down the arm, associated with trophy of various muscles of the upper extremity on the side of the lesion; (4) Horner's syndrome on the involved side; (5) localized rib destruction limited to the first three ribs and occasionally associated with vertebral infiltration and (5) death occurring as a result of comparatively trivial growth without demonstrable roentgen evidence of metastases. The author has reviewed the literature and finds the weight of evidence to indicate that most apical tumors are primary in the lung but that other primary and metastatic tumors may occur in this region many of these lesions may resemble the tumors described by Pancoast.

Five cases of apical lung tumor which produced signs and symptoms similar to those described by Pancoast are reviewed. The first patient had a large carcinoma of the lower third of the esophagus with metastases to the mediastinal lymph nodes, the right pericardium, the right posterior chest wall, and the upper thoracic vertebrae. In the second case autopsy showed a small scirrhous carcinoma of the stomach with metastases to the left adrenal gland and to the apex of the lung. In the fourth case a large round fibrous growth, found at the pericardium, measured approximately 10 cm in diameter and involved the pleura, the ribs, and the lateral aspect of the upper dorsal vertebrae. The histological characteristics of this tumor are those of primary carcinomas of an typical variety. In the fifth case a soft tissue lesion of the right pericardium, associated with destruction of the transverse processes and pedicles of the seventh

cervical and first thoracic vertebrae and of the portion of the first rib on the right side (level of the first rib) and vertebrae. In addition to the skull pelvis. On needle biopsy the tumor was found to be malignant metastasizing chromatinoma. Twelve months later however carcinoma of the thyroid was found at operation.

The author concludes that there is no specific tumor in the apex of the lung which produces characteristic signs and symptoms previously described by Pancoast. Many types of cancer can produce these changes. HAROLD C. OBERVIER, M.D.

Laddy E. T., and Moersack, H. J.: Roentgen Therapy for Bronchogenic Carcinoma. *JAMA* 1935, 104, 5-30

The authors compared the results obtained from roentgen therapy in a group of 5 cases of primary bronchogenic carcinoma with the results of another group of 25 proved cases in which roentgen therapy was the only form of therapy employed. They regarded the proved case as one in which tissue from the tumor on microscopic examination showed the presence of carcinoma.

In all cases in their study there was microscopic confirmation of the clinical diagnosis. All of the patients considered in this study were examined by the same group of clinicians and roentgenologists and the treatment was given by the same group of radiologists. Many more than 5 patients received roentgen therapy for primary carcinoma of the bronchus, but since there were only 25 who did receive roentgen therapy the authors thought advisable for purposes of comparison to limit the group to those who did receive such therapy to the same number as those who did not.

Primary carcinoma of the bronchus is usually slow in its onset, and it is often difficult to distinguish it from other forms of pulmonary disease. It may therefore be overlooked because of the fact that the symptoms of the onset may blend imperceptibly with the clinical symptoms that may arise as a result of other pulmonary disease. In certain instances, however, there is a history that the patient apparently enjoyed perfect health and then suffered sudden onset of symptoms such as pulmonary hemorrhage or severe paroxysms of cough.

From the standpoint of symptomatology there was no difference whatever so far as the clinical course was concerned between the two groups in this series.

It is not worthy that there are rather low incidence of peripheral tumors, such as those originating near the pleura and those of the Pancoast type. This may be attributable in part to the fact that in the majority of the cases in this study the diagnosis was based on microscopic examination of tissue obtained through the bronchoscope. The main cases in which the lesion was situated in the periphery of the lung and in which the diagnosis was not established by biopsy were not included in the study.

To avoid all controversy over classification the authors divided the tumors according to their obvious structure, that is, adenomatous or epitheliomatous and subdivided them according to their index of malignancy as determined by Broders personally. Such a classification is simple, clear, not ambiguous, and easy to use, it seemed to the authors to be more advantageous than other more elaborate and perhaps more confusing classifications.

Outstanding is the high incidence of tumors of the highest grades of malignancy. In fact, of the 250 tumors the authors considered, 212 were of the most malignant type. There is however, nothing remarkably different in regard to the distribution of tumors according to their index of malignancy whether in the treated or the untreated groups. As a matter of fact, the index of malignancy played no rôle whatever in the decision as to whether a given tumor was or was not suitable for roentgen therapy.

For the purpose of record it can be stated that there was 1 case of hemangio endothelioma of the trachea. One of the 8 adenocarcinomas, Grade 1, occurred in the trachea, 1 in the left upper lobe and 2 each in the right main bronchus, the right middle lobe, and the right lower lobe, respectively.

To evaluate roentgen therapy for bronchiogenic carcinoma, the authors presented an analysis of the results which they obtained in a group of 125 proved cases of bronchiogenic carcinoma in which the treatment had been given by various roentgenological methods.

Nineteen patients were in the terminal stages of the disease when encountered, but even in those who did receive some treatment, little was accomplished because 37 died within four months.

Three patients lived a year or more without treatment after histological proof of the diagnosis. As a matter of fact, all 3 of these patients had roentgen therapy elsewhere but were listed as untreated because they did not receive treatment at the clinic.

Twelve patients had incomplete or "placebo" treatment, and 2 others had roentgen therapy of moderate voltage. All 14 patients, who for all practical purposes were untreated, followed the course of the untreated patients.

Regardless of the amount of roentgen therapy which they actually received, 25 of these 125 patients lived for at least one year after treatment. In general, adenocarcinoma, Grade 1, has the most favorable prognosis of all these lesions, and, as a whole, patients with adenocarcinoma do better than those with epithelioma. Fifteen of these 25 patients had adenocarcinoma. Of these 15 lesions, 4 were Grade 1, 2 were Grade 2, 4 were Grade 3, and 5 were Grade 4. Ten of these 25 patients had squamous cell epithelioma. Of these 10 lesions, 5 were Grade 3 and 5 were Grade 4.

In the series of 250 cases of proved bronchiogenic carcinoma, the prognosis was poor because of the advanced stage of the disease at which a correct diagnosis was made. Nevertheless, the authors' results showed that roentgen therapy not only is an

excellent method of palliation but also that it has produced so called cures. They, therefore, think that any patient who is not in too precarious a physical condition should have at least one course of roentgen therapy, otherwise, his life expectancy is, at most, one year. On the other hand, 25 patients in the series lived from one to twelve years after roentgen therapy. The data are inconclusive but it seems to the authors that, in general, adenocarcinoma is a more favorable type of tumor than epithelioma. The question of the best method of treating bronchiogenic carcinoma with roentgen rays, they thought, had better remain unanswered for the present.

HEART AND PERICARDIUM

Cutler, L. C., and Hoerr, S. O. Total Thyroidectomy for Heart Disease. *Ann Surg*, 1941, 113: 245.

The authors have presented a detailed report of 57 consecutive cases of total thyroidectomy for heart disease during 1932, 1933, and 1934. There were 5 postoperative deaths. There are now 12 survivors in the group of 32 patients with angina pectoris, and 4 in the group of 25 who presented congestive heart failure.

From their experience, the authors believe that in a selected group of patients with intractable angina pectoris, total thyroidectomy is a worthwhile therapeutic measure and is not too great a risk. However, in other types of heart disease, the results are not gratifying. JULIAN A. MOORE, M.D.

ESOPHAGUS AND MEDIASTINUM

Freeman, E. B. Conservative Treatment of Achalasia. *Arch Surg* 1940, 41: 1141.

The success of conservative treatment of achalasia depends on complete dilatation of the cardia. This procedure is best accomplished in one of five ways: (1) dilatation with mercury filled bougies, (2) dilatation with bougies passed through the esophagoscope, (3) dilatation with the combined mercury bougie and pneumatic dilator, (4) dilatation with a pneumatic or hydrostatic dilator, and (5) dilatation under fluoroscopic control. It has been definitely proved that the dilated esophagus never regains its normal tone. However, the obstruction can be sufficiently overcome in most cases so that the contents of the esophagus pass freely through the cardia. Of these various methods, the author believes that the pneumatic or hydrostatic dilator is the most satisfactory. He has used it for many years and obtained satisfactory results. Air instead of water may be used to distend the dilating bag. The success of the treatment depends entirely on complete dilatation of the cardia. This author believes that this can not be accomplished by the mercury filled bougies or by the passage of bougies through an esophagoscope because of the fact that neither of these procedures completely dilates the lower end of the esophagus. Complete dilatation can be accomplished only by an

instrument with a dilating bag sufficiently large to dilate the cardia completely. Of all the different types of instruments that he has used, this author believes the one adapted best for the purpose is the Fummeier cardiopneum dilator.

J. D. VAN WILLEN, M.D.

MISCELLANEOUS

Rolland, J. and Tournier, N. G. Pulmonary Abscess Following a Mega Esophagus, Operated upon in One Stage after the Creation of Artificial Pleural Symphysis; Cure (Abscess du poulmon consécutif à un mega-œsophage opéré en un seul temps après création de symphyse pleurale artificielle; guérison) *Presse méd.*, Par. 940 48 4.

Rolland and Tournier report a case in which the diagnosis of pulmonary abscess was made on the basis of the clinical symptoms and confirmed by roentgenological examination. According to the roentgen findings, the pulmonary abscess was located in the median lobe of the right lung, close to the anterior thoracic wall. The roentgenogram also showed a peculiar image in the region of the posterior mediastinum with the use of the opaque meal, this was shown to be a mega-esophagus. There definite starts in the esophagus it seemed probable that when the patient lay down some of the contents were aspirated into the bronchi and thus as the cause of the pulmonary abscess.

In the operative treatment of the pulmonary abscess, the authors employed the method that they have previously described drainage and elimination of the abscess cavity in one-stage operation after the creation of an artificial pleural symphysis by injection of a sclerosing solution into the pleural cavity. In this case the injection was followed by myositis of the pectoral muscles (pectoralis major) this as the first time this complication occurred in the authors experience. It was not serious and subsided promptly under treatment; however it prolonged the period of pre-operative observation somewhat. Usually five days are sufficient to establish the local pleural symphysis after the injection of the sclerosing solution but in this case five days elapsed before the myositis subsided. The injection of sclerosing solution (quinine and urea hydrochloride) had been made in the fourth intercostal space, near the site of the abscess. At operation the fourth rib was resected, and the parietal pleura was found to be closely adherent to the cortex of the lung. A sufficient portion of the lung was resected with the electric cutting current to eliminate the abscess cavity; the abscess was treated by electrocoagulation. The authors have found that this procedure favors healing, probably because of its effect on the blood vessels. The patient made good recovery and was relieved of symptoms at the time of his discharge.

LUCIE M. MERRIN

SURGERY OF THE ABDOMEN

GASTRO-INTESTINAL TRACT

Gray, J. S., Wieczorowski, E., and Ivy, A. C. Inhibition of the Gastric Secretion in Man with Urogastrone. *Am J Digest Dis*, 1940, 7: 513

Experimentally, an active principle, "enterogastrone," can be extracted from intestinal mucosa, which will inhibit gastric secretion and motility when injected parenterally.

Attention has been directed in the literature to the urine as a possible source of the gastric inhibitory principle or principles. It has been reported that commercial extracts of human pregnancy urine containing the chorionic gonadotropic hormone were potent in preventing or delaying the onset of experimental ulcers in dogs. In addition, an inhibitory factor has been reported to be present in the urine of patients with peptic ulcer, pernicious anemia, and gastric carcinoma, in the urine of normal dogs and dogs subjected to gastrectomy or duodenectomy, and in the gastric juice of patients with pernicious anemia or gastric carcinoma.

The question of specificity arose when it was found that urine extracts contain a pyrogen, or fever-producing substance, because fever depresses gastric secretion. However, extracts were prepared from human urine which were entirely free of pyrogenic impurity. When it was found that the gastric inhibitory factor was distinct from pyrogen, the gonadotropic hormones, and apparently the ulcer preventive factor, it was given the name "urogastrone." This term was coined to distinguish the urinary factor from "enterogastrone," until the two had been proved to be identical.

In regard to the source of urogastrone, it has been found that when the small intestine of dogs is removed urogastrone disappears from the urine. It has been found recently that a control operation consisting of identical procedures with the exception that the small intestine was not removed from the abdominal cavity does not cause urogastrone to disappear from the urine. These observations suggest that urogastrone comes from the small intestine.

Obviously, urogastrone, as well as enterogastrone, has therapeutic promise in that it may provide a practical method for the control of gastric secretion. With this idea in mind the effects of a purified preparation of urogastrone on gastric secretion in a group of human subjects were investigated by the authors.

The subcutaneous administration of a potent preparation of urogastrone to 9 human subjects significantly reduced the gastric secretory response to histamine with regard to the volume of gastric juice, its acidity, and the output of free acid. This inhibitory action was obtained with no other observed effects than a mild local erythema and tenderness at the site of injection.

SAMUEL H. KLEIN, M.D.

Stoppani, F., and Matli, G. Gastric Peristalsis and Solid Ingesta: Roentgen Findings in the Normal Stomach and after Operation. (Peristalsi gastrica e ingesti solidi. Rilievi radiologici nello stomaco normale e operato). *Radiol med*, 1941, 28: 15

In a stomach containing liquid barium it is impossible to observe the movements of the mucosa and determine what part they play in the mixing and expulsion of the contents. The authors therefore decided to try the use of solid ingesta, making use of the olives ordinarily used for diagnostic purposes and filling them with barium. In the normal stomach the mucous membrane formed grooves along which these olives passed in single file to the pylorus where they underwent a movement of rotation and one by one passed through the pylorus. This peristaltic movement which forced them along the greater curvature to the pylorus was performed almost entirely by the mucosa of the greater curvature.

In stomachs on which gastro enterostomy had been performed the olives progressed toward the anastomosis in single file, as they did in the normal stomach, and when they reached the anastomosis they underwent the same rotation and collected in a figure resembling the petals of a daisy, after which they passed out one by one. These findings are illustrated by roentgenograms. This behavior of the olives seemed to show that remarkable functional adaptation had been established in the resected stomach.

The authors believe that this method of examining the stomach with solid ingesta should be more commonly used, as in some cases it may show better than examination with liquids the functional integrity both of the normal stomach and the stomach that has been operated on. AUDREY G. MORGAN, M.D.

Woldman, E. E. The Treatment of Massive Gastro-duodenal Hemorrhage by the Continuous Administration of Colloidal Aluminum Hydroxide. A Report of 144 Cases. *Am J Digest Dis*, 1941, 8: 39

One hundred and forty-four patients with massive hemorrhages resulting from gastric or duodenal ulcer were treated by the continuous administration of colloidal aluminum hydroxide. In this series, there were 3 deaths, or a mortality rate of 2 per cent, as contrasted to a mortality rate of 28 per cent during a similar period at the same hospital, preceding the inauguration of this form of medical treatment.

The continuous administration of colloidal aluminum hydroxide in massive gastric hemorrhage presents certain advantages over other methods of treatment.

1. It is a harmless, non-absorbable astringent which is capable of hastening the formation of a clot.

By virtue of its antacid properties it can prevent the digestion of the clot by continuously neutralizing the excess acid in the stomach, without danger of alkalosis.

3. Because it is a gelatinous substance it has the additional advantage of mechanically protecting the lesion.

4. As the result of continuous administration of colloidal aluminum hydroxide both day and night, the delicate granulation tissue formed in the process of healing is not destroyed by the accumulation of acid during the night and thus the lesion is permitted to heal.

This treatment accomplishes a three-fold purpose: it arrests the bleeding and protects the ulcer to facilitate its healing.

As soon as a patient with melena is admitted to the hospital, a soft nasogastric tube is passed through the nose to the cardiac end of the stomach, and the drip treatment is begun. If hematemesis is present, the patient receives colloidal aluminum hydroxide by mouth every hour until vomiting ceases, then the drip treatment is begun.

These patients receive soft bland diet every six hours, which is the same as that administered to other patients with peptic ulcer. To induce rest, the hypodermic administration of sodium phenobarbital is preferred to that of morphine because morphine not only interferes with the normal functioning of the gastro-intestinal tract but also has the undesirable effect of causing emesis in some instances. Small transfusions, usually of about 50 ccm. of blood, are given, if indicated.

The technique of delimiting colloidal aluminum hydroxide by the drip method requires hospitalization of the patient. The colloidal aluminum hydroxide diluted to 33½ per cent suspension is continuously instilled into the stomach through a nasogastric tube at the rate of about 5 drops each minute during the night as well as during the day, for ten days. The flow of the drops is regulated and controlled by a special apparatus.

The indwelling nasal catheter as the source of considerable difficulty in some of the early cases. When a small Levin tube was used, the lumen was so small that it would become occluded by particles of food regurgitating back into the tube or by thick coating on the wall of the tube of the aluminum hydroxide itself. This of course caused cessation of the flow, and necessitated troublesome irrigation of the tube which corrected the difficulty only temporarily and therefore had to be repeated frequently. When large Levin tube was used, many patients complained of soreness in the nose and throat, even when the tube was well lubricated with mineral oil, and frequently they could remove the tube themselves when the discomfort became too great.

These difficulties were overcome by the use of a collapsible rubber tube, about ½ inch in diameter which was passed through the nose into the stomach with the aid of silk suture material. This tube has entirely eliminated the difficulties of

obstruction of the lumen and discomfort to the patient which were experienced with the Levin tube. The nasogastric tube is passed only as far as the lower end of the esophagus. This precaution eliminates the rare possibility of any danger of trauma to the lesion by the tube.

In the few instances in which patients objected to or could not tolerate the nasogastric tube, the medication was administered by mouth. One ounce of 33½ per cent suspension of colloidal aluminum hydroxide in water was given every hour during the day until the patient retired and thereafter he was awakened every 1½ hours during the night to receive the same dose. Usually sedative administered in the evening, so that the patient fell asleep promptly after being aroused for the medication. With the drip method, of course the patient rest all night without interruption.

Inasmuch as thestringent action of aluminum hydroxide causes some constipation, mineral oil is given daily or as needed every other day.

SAMUEL H. KLEIN, M.D.

NOTAIA, W. H. C. Hematemesis from Peptic Ulcer—The Case for Operation; Chronic Gastric Ulcer; Chronic Duodenal Ulcer; Gastrostomy; Carcinoma of the Stomach. *Lancet* 94, Apr 33

It is a fallacy to estimate the mortality from hemorrhage in peptic ulcer as the percentage of the whole number of the cases irrespective of their severity. The fatal cases are usually those with eroded arteries and the thoracic artery. It is therefore in these severe cases that it is safer to explore than to wait for further hemorrhages. The thoracic attempts to revise the case for the surgeon with the plea that the light of his own experience is a bolder attitude be taken on the part of the average surgeon with some experience in gastric surgery.

The management outlined is blood transfusion plus maximum operative procedure. The surgeon should be satisfied with the arrest of hemorrhage alone. There is no necessity for the average surgeon to concern himself with any procedure such as gastrectomy which directed toward preventing further ulceration, when the hemorrhage may itself necessitate resection. The simplest and quickest methods are indicated. The use of clamps or other special apparatus is best avoided when possible. The ulcer is resected by method of gradual extension.

The simultaneous closure of the gastric and duodenal wound. The hole in the lesser curvature is never large. Bleeding from the cut edge is diminished and the extrusion of the contents is actual extension is under complete control of the operator from start to finish. The suture is tied on one side before the hemostasis is opened and the sutures are held by

sutures which keep the part steady and maintain traction. After each step of the operation the right or left of the stomach is resected and the next cut is made. The suture is held in place and the next cut is made. The suture is held in place and the next cut is made. The suture is held in place and the next cut is made.

There were 2 fatalities, 1 from carcinoma of the stomach and 1 from duodenal ulcer, in the series of 18 patients with peptic ulcer and severe hemorrhage
SAMUEL J FOGELSON, M D

Livingston, E M, and Pack, G T Surgical Aids to the Intracavitary Treatment and Study of Cancer of the Stomach *Am J Surg*, 1941, 51 453

Operative surgery for stomach cancers is divisible into four types (1) exploratory surgery (peritoneoscopy, laparotomy), (2) excisional surgery (total gastrectomy, cardectomy, partial gastrectomy, segmental resection), (3) palliative surgery (gastro enterostomy, gastrostomy, pyloric exclusion, jejunostomy), and (4) radiation surgery and electro-surgery (combined treatment)

This monograph deals with pioneering activities in the field of combined therapy and endogastric instrumentation. New methods of approach to the gastric lumen, new forms of gastric irradiation, and new types of intraluminal equipment are depicted. Except for oral instruments, such as the flexible gastroscope, which are passed into the stomach by way of the mouth and esophagus, all endogastric studies and therapy are dependent on surgery for their clinical application. Treatment must be either given during the course of an exploratory operation following intraperitoneal exposure of the gastric

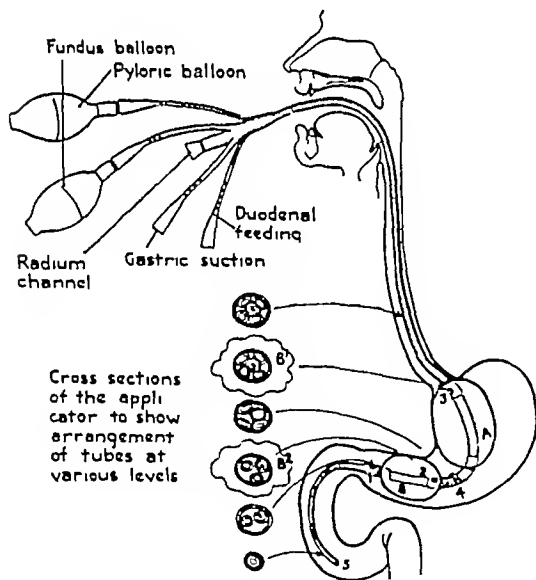


Fig 1 The Livingston multiple lumened radium applicator for the intracavitary treatment of cancer of the stomach. A—Fundus balloon B—Pyloric balloon 1—Radium channel 2—Airway to pyloric balloon 3—Airway to fundus balloon 4—Gastric suction channel 5—Duodenal feeding channel (Rings on tubes of hydra head correspond to numbers)

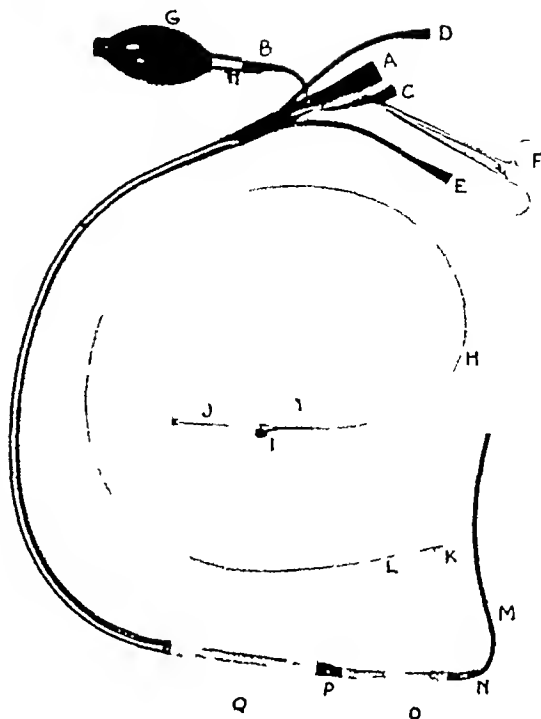


Fig 2 Details of construction of the multiple lumened radium applicator for the intracavitary treatment of cancer of the stomach. A, radium channel, B, inflation channel for pyloric balloon, C, inflation channel for the fundic balloon, D, gastric suction channel, E, duodenal feeding channel, F, clamp closing an air way, G, inflation bulb attached to an air way, H, the flexible radium core, I, set screw for stylet, J, the stylet or ejector, K, detachable tip for loading the radium or radon capillary tube, L, site for storage of radioactive tube, M, duodenal feeding tube, N, terminal opening of radium channel, O, pyloric balloon, P, gastric suction opening, Q, fundus balloon

mucosa, or administered postoperatively by way of a surgically created gastrostomy gooseneck tract. The technique and equipment for endogastric instrumentation and intraventricular irradiation described by the author offer added incentive for further clinical studies in this field. Such physical appliances as an anterior gastroscope or operating televestroscope, multiple lumened radium applicators, endogastric balloons, electrosurgical biopsy tools, contact x-ray anodes, air-valves for a control of larger gastrostomy fistulas, cameras for photographing in color the gastric mucous membrane and other instruments depicted, now furnish the necessary means for conducting vigorous clinical tests in this domain.

In such a situation certain queries naturally arise. Radiation therapy for gastric cancer has lagged appreciably behind the impressive successes of radiation methods in the control of malignant tumors in

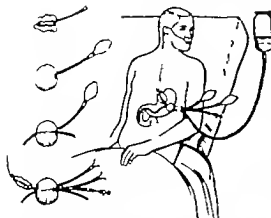


Fig. 3. Retrograde insertion of an intracavitary radium applicator. The patient has swallowed a cord which has been brought to the body surface through jejunostomy. The radium applicator has been attached to this cord and drawn into position within the stomach. A feeding tube is also in situ. Both the feeding tube and the radium applicator have been passed through the central lumen of gastrostomy air-valve, which locks them in position. Insert to show use of Livingston air-valve. (Courtesy of American Journal of Surgery.)

other organs and sites. There is no record of a single patient with verified gastric carcinoma treated by any form of radiation therapy without gastrectomy who has survived treatment by as long as three years. Since unaided external radiation is not adequate to furnish a suitable number of threshold erythema doses for gastric carcinomas, adjuvant intracavitary therapy becomes prime necessity if definitive cures are to be obtained. Successful intracavitary radiation must deal with far more than the major problem of derivate tissue damage. It must also provide for maintenance of nutrition, protection of neighboring vital organs, and avoidance of necrosis, perforation, or hemorrhage. Relief from obstructions to gastric inlet or outlet and provide for motility difficulties. The radium applicators described by the authors prove capable of delivering in a single treatment as many threshold erythema doses to all parts of the tumor as can now be given by any form of external irradiation in a period of from fifteen to thirty days of uninterrupted daily treatment. With this equipment it now for the first time becomes physically possible to carry routinely the total tissue doses of irradiation for stomach cancer to any level desired.

JOSEPH K. NARA, M.D.

Vicars, E. P. Gastrectomy: Its Results (La gastrectomía, sus resultados). *Bolet. Inst. de cirugía. Univ. de Buenos Aires*, 910, 6-457.

Since Rydger performed the first gastrectomy in 1875 this operation has been used very extensively in surgery. New techniques have been devised and

clinical and roentgen studies have been pursued actively. The author describes and illustrates the different techniques and gives statistics on the immediate and late results. He also discusses the changes in gastric secretion in patients who have undergone this operation and considers the roentgen study of the stomach illustrating his text with many roentgenograms.

He concludes that gastrectomy marked decided advance in the surgical treatment of gastroduodenal ulcers, but that its indications are certainly decreasing when the cause of these lesions has been discovered. In the meantime it is the operation of choice.

Among the different methods used, those of Polya and of Hofschröter and Finsterer show the lowest mortality. Resection, exclusion, and gastrectomy in the early stages do not seem to be superior to resection with simple gastro-enterostomy in the treatment of ulcers.

The operative and postoperative complications of the operation may be reduced to a minimum if the surgeon remembers that he is facing a very complex surgical problem which requires every careful selection of patients, the greatest possible perfection of technique, and the most meticulous pre-operative and postoperative care. The mortality of the operation has decreased in recent years, as has that of all difficult abdominal operations because of perfection of technique and improved care.

The late results of the Polya and Hofschröter Finsterer methods maintain their leading position provided the lesion and the zone of surrounding gastritis resected.

The secretory and motor changes following the operation show that the stump of the stomach passes through a period of functional adaptation which lasts for variable length of time and which necessitates great care in diet in order to assure success.

Some patients have anemia after the operation but this author has never seen it severe enough to lead him to doubt the wisdom of his choice of operation. Patients who have undergone gastrectomy may have disturbances of pancreatic function which are manifested by diarrhea, the poor digestion of fats and carbohydrates, and glycosuria. The most serious problem presented by this type of operation is peptic ulcer which comes later complication.

JOSEPH K. NARA, M.D.

Egger, C. Acute Diverticulitis and Sigmoiditis. (Diverticulitis, 1935).

This report is based on the cases of 8 patients with symptoms of fluent severity that warrant surgical consultation. The majority of patients with acute diverticulitis and sigmoiditis recover with conservative treatment and may guard against recurrence by the regulation of their diet and bowel habits.

Diverticulitis complicated by perforation may present the picture of spreading peritonitis of doubtful origin or there may be pain localized in

the left lower quadrant. When the abscess is in the midline or in the pelvis, a positive diagnosis may not be possible until after the abdomen has been opened. When the signs are mild, study and observation are permitted, and a late diagnosis can be reached the same as in uncomplicated cases. In acute surgical emergencies requiring prompt attention, the author advises operation and diagnosis after incision.

In cases of gross perforation, the author advises exteriorization if possible, and resection later. If this is not possible, ample drainage and colostomy above the lesion is the procedure of choice. If the exudate resulting from the perforation has been walled off to form an abscess, early and adequate drainage is essential.

When diverticulitis results in intestinal obstruction the differential diagnosis between diverticulitis and carcinoma is very difficult and sometimes impossible. If the obstruction is acute and apparently complete, prompt operation is indicated, and should be of a palliative nature (cecostomy, colostomy, or first stage Mikulicz procedure). A differential diagnosis may be possible after subsidence of the acute symptoms, and will influence further treatment.

Gross examination of resected specimens reveals either a normal mucosa or one with redness and superficial erosions, but no ulceration. The lesion is confined to the wall and perigmoid tissues. Often no diverticula are visible externally. They are small and still intramural. These early diverticula become inflamed, perforate into the wall, and produce a phlegmon which, in turn, produces a tumor mass. An inflamed, fully developed diverticulum is more likely to perforate externally and give rise to peritonitis.

In 34 patients (41.5 per cent) some type of operation was performed. The indications for operation were perforation with abscess or peritonitis, obstruction, persistent pain, recurrent attacks, or the suspicion that carcinoma might be associated with the condition.

Twenty patients (24.4 per cent) developed acute perforation with abscess formation or peritonitis. In 14, a simple drainage operation was done, in 5 others, drainage plus some other procedure was carried out, 1 was not operated upon. The early mortality in this group was 45 per cent. One late death from complications brought the mortality due to perforation to 50 per cent.

Twenty-three other operations were performed by means of exploratory celiotomy, or exploration with separation of adhesions, colostomy, cecostomy, or resection. There were no deaths in this group.

Carcinoma was associated with the diverticulitis in 5 patients, all of whom eventually succumbed to the condition. The total mortality directly traceable to diverticulitis of the sigmoid colon was 16, or 19.5 per cent.

Attention is directed to the seriousness of the condition, and it is stressed that diverticulosis is not an innocuous lesion. Once the condition is recognized, the patient must be warned of possible

danger and given instructions in order to avoid complications.
HAROLD LAUFMAN, M.D.

Rumbold, L. Some Factors in a Lowered Mortality Rate for Acute Appendicitis, Analysis of 2,013 Consecutive Cases. *Arch Surg*, 1941, 42: 25

The author presents his third statistical report of the cases of acute appendicitis occurring in the Genesee Hospital, Rochester, New York. All cases were proved instances of acute inflammatory disease of the appendix. They occurred during the period from 1925 through 1938 and were divided into two five-year periods and one four-year period for comparison.

Since 1930, with 133 proved cases of acute appendicitis and a mortality rate of 6.01 per cent, the number of cases in this hospital has increased 25 per cent while the mortality rate decreased yearly. In 1938, there were 199 cases with a death rate of only 0.5 per cent. Certain factors appear to have contributed to the further reduction in mortality. They may be summed up as follows:

Continued education of the public against delay in diagnosis and treatment. Continuous education of physicians to keep them "appendicitis conscious." Pre-operative preparation of the patient who is acutely ill with high fever, high pulse rate, dehydration, and shock. Attempt on the part of the surgeon to evaluate the stage of appendicitis, the choice of anesthetic, and the proper incision. Postoperative care with attention to fluid balance, use of the duodenal tube to combat nausea and vomiting, and avoidance of fluids or food by mouth until restoration of bowel tone has occurred. The patient's condition can apparently be judged by means of daily leucocyte counts and frequent blood-pressure readings. With a marked fall in blood pressure, transfusion may be essential.

The factors credited with the reduced mortality rate are better postoperative care of the patient, use of the McBurney incision, and closure of all wounds except in cases of well walled off abscess. In a small series of patients in which the Ochsner delayed treatment had been used, the results appear to show that this treatment has a place in the armamentarium of the surgeon.

JOHN W. NUZZUM, M.D.

Hicken, N. F., and Carlquist, J. H. Primary Appendiceal Abscesses. *Arch Surg*, 1941, 42: 156

In 528 cases of acute suppurative appendicitis there were 53 primary abscesses (10 per cent). These abscesses were located contiguously to the cecum in at least 75 per cent of the cases, but some were localized in various other regions and were designated as subhepatic, subphrenic, ileocolic, and pelvic abscesses.

The pericecal abscesses were always connected with the appendix, although the appendix may have been difficult to find. Complete disintegration and sloughing of the appendix occurred rarely. Circumcecal abscesses often were multiple or multilocular and in these cases incomplete drainage often result-

ed Retrocecal abscesses or point toward the subhepatic space and occasionally cause urethritis, pyuria and other urinary symptoms leading to mistaken diagnosis of perinephritic abscess.

Pericecal abscesses should be drained through adequate incision made directly over the tumescence, care being exercised to prevent injury to intervening loops of bowel.

The authors removed the appendix in 39 of 4 cases of pericecal abscesses at the primary operation and believed that by doing so the morbidity and mortality rates were reduced. In cases of an associated cecitis, difficulty may be encountered in ligating, saturating the stump of the appendix. If this difficulty is encountered, suturing over with omentum or mesentery or the insertion of a cecostomy tube overcomes the difficulty. If the patient is very toxic, simple drainage alone is indicated, the appendix being removed at secondary operation.

Subhepatic and subphrenic abscesses occurred by upward extension either through contiguity or the lymphatics. These abscesses occurred usually from eight to ten days after the onset of primary infection or the surgery. Left pain in the right chest and right supraclavicular area, increased toxicity, tenderness over the twelfth rib and high fixed right diaphragm. Diagnostic aspiration is condemned. Exploration and drainage should be carried out by the posterior extracostal route with resection of the twelfth rib.

Neocolic abscesses lying mesial to the cecum are particularly dangerous because of their tendency to produce intestinal obstruction, mesenteric thrombophlebitis, segmental gangrene of the bowel and pyelophlebitis. There is also great danger of generalized peritonitis resulting from spontaneous rupture of the abscess or from injudicious manipulation at operative drainage. Usually no attempt should be made to remove the appendix at the primary operation.

Pelvic abscesses were readily diagnosed by rectal and pelvic examinations. Many of these abscesses were spontaneously absorbed but delayed drainage is attended with risks. In the female drainage is best accomplished through the vagina, and in young children and males through the rectum. The abscess is opened with blunt forceps after an incision had been made through the rectal or vaginal wall.

Pyelophlebitis and portal thrombosis occurred time up to six weeks, and as serious complication. Early exploration, drainage of regional abscesses, and ligation of involved venous radicles combined with intensive chemotherapy offered the only help.

Pre-operatively the patient should be prepared by gastric lavage, restoration of fluid balance and transfusion if indicated, since no immediate emergency exists in cases of appendical abscesses. The choice of spinal anesthesia as it offers many advantages.

Intestinal therapy is of greatest importance and includes gastric decompression with Levine tube, parenteral administration of fluids and vitamins, and the use of sedatives and hot fomentations indicated. Sulfanilamide is advocated in large doses by mouth, subcutaneously or intramuscularly. Under the regime described the authors' mortality rate was 8 per cent. LARSEN H. WOURT MD

Carrera, J. *Physiopathology of the Colon Studied by New Method (Fisiopatología del colon estudiada por un nuevo método)*. Arch. argent. de enfer., 4, par digest. 940, 16 5.

The intestinal tract of every individual has its own characteristics, and though it may function properly and normally it may present enormous differences from those of other individuals particularly regarding anatomical speed of evacuation and reflex action. There are many variations in the function of evacuation which are compatible with health.

The author points out the importance of utilizing the ingested food itself as means of gaining evidence of reflex disturbances provoked not only by allergies but also by inflammatory conditions of the digestive tract. The conclusions derived from this study are the following: reflex gastric retention or colonic hypermotility or spasticity may be caused by alimentary allergy and there may be another type of reflex disturbance, the large and small intestines also due to the allergic action of certain foods.

In his study the author used substances which would cause a speedy reaction in the intestines, and thus disclosed the pathological changes and their most vulnerable points. The procedure is as follows:

At midnight the patient is given 50 gr. of barium sulfate dissolved in water. Nine hours later the first roentgenogram is taken, immediately afterward 50 gr. of sodium sulfate mixed with the same solution of barium which was given the night before are administered. The second roentgenogram is taken as soon as the patient feels the first colic, and the next patient is secured just before evacuation. After evacuation still another roentgenogram is taken.

This method excludes errors and saves time. It reveals clearly the part of the entire digestive apparatus. It shows the functional interdependence of stomach and colon, and it permits close study of colonic function. According to this method, evacuation and reflex function are accomplished in the normal individual in from two to three hours. Fifty per cent of the intestinal content is evacuated. In the majority of cases of diarrhea, evacuation of the intestinal content takes place in one or one and one-half hours. In constipation from six to ten hours or more are required before evacuation takes place.

When there is no gratification of the viscera or difference due to organic processes, the colon contracts and functions freely, and this is visible. When the viscera are impeded in any way, segmentary obstruction of the colon and functional disturbances can be seen. (Rev. H. W. 123)

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Bengolea, A J, Velasco Suárez, C, and Negri, A
A Study of the Normal and Pathological
Physiology of the Bile Tract (*Consideraciones
sobre la fisiología normal y patológica de las vías
bilíares*) *Bol y trab Acad argent de ciruj*, 1940,
24 1091

The authors emphasize the importance of a thorough knowledge of the physiology of the hepatobiliary tract in order to avoid performing operations contrary to normal physiology. They present photomicrographs showing the histological picture of the different parts of the tract and illustrating their argument.

They hold that the hepatocommon duct is a tube of elastic connective tissue which presents a complex sphincter mechanism only at the end. This sphincter mechanism consists chiefly of the sphincter of the common duct. Vater's ampulla is an organ that is undergoing retrogression in the human being and is a union of the common duct and Wirsung's duct. The ampulla in some of the lower forms of animals is described. Vater's papilla is represented in the majority of cases by the union of the two ducts and its musculature is only slightly developed.

The most important organ physiologically is the sphincter of the common duct, which by its tonicity permits filling of the gall bladder and on contracting independently prevents the bile from passing into Wirsung's duct, so that the latter duct can evacuate the pancreatic juice independently. The proximal part of the common duct has almost no muscle fibers and in some cases there are hardly any longitudinal fibers. The hepatic duct has no muscle bundles but is very rich in elastic fibers. The cystic duct does not have any muscle fibers.

The hepatocystic spur, or valve of Puelch, has the task of regulating and directing the current of bile, either into the gall bladder or from there into the duodenum, and thus prevent the reflux of the liquid into the hepatic duct. Such a reflux into the hepatic duct may take place when this valve is insufficient from temporary or permanent dilatation of the common duct. The theory that there is a sphincter of the hepatic duct should be given up entirely.

The bile tract is essentially a system of elastic tubes, and dilatation of the chief ducts, if there is no obstruction at the end, is due to a mechanism of compensation which should be respected. Under these circumstances no operation for derivation of the bile should be performed, these operations should be reserved solely for cases of cicatricial stenosis or neoplasm of the terminal end of the tract.

AUDREY G MORGAN, M D

Berger, S S, and Applebaum, H S Toxic Hepatitis Due to Sulfanilamide *J Lab & Clin Med*, 1941, 26 785

A case of fatal hepatitis (subacute yellow atrophy of the liver) is presented. Only 26.6 gm of sulfanila-

mide were ingested, 20 gm of which were distributed over a period of ten days.

The patient underwent a prostatectomy for benign hypertrophy and chronic and subacute prostatitis. As part of the preoperative treatment, 10 gr of sulfanilamide were given three times daily for three days. There were no untoward symptoms. Because of pyuria three weeks after discharge from the hospital, the patient was given six 5 gr tablets of sulfanilamide daily for ten days (total 20 gm). Soon after starting the drug he began to have anorexia, nausea, and weakness, and began to pass "coffee-like" urine and light-colored stools. As soon as the drug was discontinued, these symptoms subsided. Physical examination revealed a considerable degree of jaundice, an enlarged liver, and a palpable spleen. The jaundice was of the obstructive type, and it was the opinion of the authors, chiefly because of the enlarged spleen, that the patient had toxic hepatitis merging into a chronic state, because of the sulfanilamide. Ascites gradually developed and increased rapidly. The patient became drowsy (cholemia) two months after the drug was discontinued and died after a week of coma.

Necropsy was not permitted, but several small segments of liver tissue were obtained through a puncture wound. The liver was firm and finely granular. Microscopic examination showed early degenerative changes in many of the liver cells. In these areas there was abundant bile pigment in the cytoplasm of the liver cells and bile in the canaliculi. In other areas the cells were necrotic. The periportal areas were infiltrated with wandering cells, most of which were small and round. The normal lobulation of the liver was destroyed, the intact liver tissue occurring in irregular small rounded nodules, characteristic of beginning cirrhosis. The anatomical diagnosis was extensive necrosis and replacement fibrosis of the liver ("toxic hepatitis," "subacute yellow atrophy," and beginning cirrhosis, "toxic cirrhosis").

There was no reason to believe that this patient had any liver damage previous to the administration of the sulfanilamide. There was a history of having fever of about five years' duration, but this could not be investigated.

Sulfanilamide should be added to the list of agents which may cause severe liver damage.

HAROLD LAUFMAN, M D

López Estévez, J Cholecystographic Study of the Gall Bladder According to Carrere's Method and Its Clinical and Operative Applications (*El estudio colecistográfico de la vesícula por el método de Carrere y sus aplicaciones clínicas y operatorias*) *Arch argent de enferm d apar digest*, 1940, 16 46

The mechanism of the biliary circulation depends on the portal circulation, the anatomical and functional integrity of the liver cells, the metabolic centers, and the central nervous system, as well as on hormonal and alimentary stimuli, the balance between the sympathetic and the parasympathetic system, and conditions of the abdominal viscera.

Among all these factors the rôle of the portal circulation is of greatest importance.

The analysis of the hepatobiliary pathology from the functional point of view can be best accomplished by a combination of cholecystography with duodenal drainage according to Cierre's method. The so-called "vesicular rhythm" can thus be visualized in roentgenograms. The first picture is taken twelve hours after an injection of a tetra-iodo product. Four-tenths of a gram of the product per kilogram of body weight is dissolved in 30 c.c.m. of double distilled water and the injection is made very slowly. After the first picture has been taken the patient is given 200 c.c.m. of a 4 per cent glucose or saccharose solution per os. The second picture is taken one half hour later, the third one hour and the fourth two hours after ingestion of the sugar solution. Under normal circumstances the shadow of the gall bladder taken one-half hour after the administration of the sugar solution is smaller than the corresponding shadow in fasting. The following picture shows a still smaller shadow. Like the size of the gall bladder in the last picture is approximately the same as in the first. Under pathological conditions, when the duodenohepatovesicular reflex is exaggerated, the shadow cast by the gall bladder grows progressively smaller. In other cases the size of the shadow may alternate large and small, large and small. In some instances a paradoxical condition may be found in the first picture taken in fasting the shadow is small, in the second it appears larger in the third it is again small, and in the fourth it resembles the size found in the second picture.

The thoracic diseases lengthen the clinical interpretation of the various types of vesicular rhythm.

JOHN K. NARA, M.D.

Smyth, M. J. Exploration of the Common Bile Duct for Stone. Drainage with the T-Tube and Cholangiography. *Brit. M. J.* 94.

Controversy about the subject of exploration of the common bile duct arises in cases in which there is little or no indication for exploration of the duct, or in cases in which there is doubt as to the interpretation of operative findings.

Indications for exploration of the common duct for stone are presented, including both clinical features and conditions for operation. Smyth argues against placing too much reliance on the presence or absence of jaundice as a clinical feature. At a conservative estimate jaundice has been absent in no less than one-third of the cases.

In cholangiography an opaque solution is introduced into the common bile duct and radiograph taken. This may be done either at the time of operation or postoperatively. In the latter event the solution is introduced through the drainage tube of the common bile duct. After surgery T-tube can be retained until liver function has been restored and after a third day cholangiography can be accomplished. Smyth considers the regular T-tube to be out of proportion and advises that the circumference

be hitched down until it measures 3/4 in. in length, and that half the circumference of the tube be removed. The tube is then easily introduced and readily removed without causing discomfort. The opening in the common bile duct is closed snugly round the tube and no stitch through the tube is necessary. A second tube provides proper drainage. Smyth is convinced that even the most competent operators can be safeguarded against error if they will adopt the principle of using a T-tube for drainage of the common duct and carry out cholangiography post-operatively.

A preference is stated for parabrodil as the opaque solution in cholangiography. Bile is first aspirated from the common bile duct through the T-tube. The opaque solution is warmed to 100°F and is then introduced from a sterile syringe. The average amount used by the author is about 5 c.c.m.

If stones are discovered by cholangiography two alternatives may be tried before resorting to further operation. Bile may be aspirated, from 1 to 2 c.c.m. of ether is introduced and the tube left open so that the ether may not cause too much pressure within the duct. This is done with the hope of dissolving the stones. The literature is studied, the effects of different drugs on the sphincter of Oddi by means of opaque media.

The T-tube should be removed when the concentration of bile salts returns to normal. Ordinarily this occurs about the fifteenth day. Symptoms consist of pain, two prolonged and continuous drainage.

FARL GUERRE, M.D.

Ironson, C. J. Experimental Bile Pancreatitis, with Special Reference to Recovery and to the Toxicity of the Hemorrhagic Exudate. *Arch. Surg.* 94: 43, 26.

The rôles of choleliths, activated trypsinogen, and bile salts are mentioned as factors in the production of pancreatitis as suggested by various authors. Opinions of many workers are given regarding the power of the pancreas to regenerate, the consensus being that it probably does so to a remarkable degree. The contention of most workers is that fat necrosis is secondary to acute pancreatitis.

Experimental pancreatitis is produced by the writer by the introduction of sterile gall-bladder bile into the accessory duct of the dog pancreas. The severity of the pancreatitis produced as proportionate to the amount and concentration of the bile used. Biopsy specimens of the pancreas are taken within two or three minutes, and of the pancreas and liver from twenty-four to twenty-eight hours later. Observations are made at weekly intervals up to eight weeks.

A detailed report of the gross and microscopic findings is given, the latter being illustrated with excellent photomicrographs.

13 of the 4 animals studied, hemorrhagic or necrotic pancreatitis accompanied by fat necrosis, as observed. The 5 other animals showed acute

edematous pancreatitis, and fat necrosis was observed in only 8 of these. This indicated that fat necrosis is more apt to be found in the more severe types of the disease.

Most of the dogs recovered within about four weeks, with residual edema and fibrosis and lymphocytic infiltration which was noted histologically. Areas of complete necrosis were replaced by scar tissue, but acinar cells that were merely damaged and not destroyed recovered, regenerated, and became functionally efficient. It is emphasized that biopsy specimens of the gland taken a short time after the presence of acute pancreatitis may appear practically normal, and erroneous diagnoses may thus be made.

Because some surgeons believe that the fluid found in the peritoneal cavities of patients with pancreatitis is toxic, and justify a laparotomy on the basis of drainage of this material, the author injected this hemorrhagic exudate intraperitoneally into mice and intravenously into dogs, and found it to be non-toxic.

The livers of these animals showed typical microscopic changes of toxemia—namely, edema, cloudy swelling, hemorrhage, necrosis, and fatty degeneration. Hepatic insufficiency must thus be considered as contributory to the toxemia of patients with acute pancreatitis.

Insufficient time intervened between pancreatic injury and biopsy of the liver to show any relation between pancreatic deficiency and fatty infiltration of the liver, as has been shown by others. It was assumed, since both conditions were produced in the same way, that acute edematous pancreatitis and acute hemorrhagic pancreatitis are stages of the same process.

S. LLOYD TEITFELMAN, M.D.

Jacquet, P., Thieffry, S., and De Chiriac, G. The Action of Ephedrine and Adrenaline in Acute Pancreatitis (L'action de l'éphédrine et de l'adrénaline sur les pancréatites aiguës). *Presse méd.*, Par., 1940, 48: 1041.

Jacquet and his associates have previously reported 3 cases of acute pancreatitis in which the typical severe epigastric pain with radiation especially to the back occurred in a sudden attack without any prodromal symptoms. The patients were very pale and showed symptoms of shock, although the blood pressure did not show any marked drop. In these cases ephedrine was employed with good results. In the first case treated, the drug was used primarily to combat the symptoms of shock; the pain was relieved when ephedrine was given in a dosage of 4 cgm daily, operation was necessary later in this case, because of pancreatic necrosis. In the second case, the initial dose of ephedrine was 8 cgm daily, later this was reduced to 4 cgm, the symptoms were entirely relieved without operation. In the third case ephedrine was given in a single dose of 4 cgm on several occasions, which markedly relieved the pain and shock, but operation was finally necessary in this case. Dreyfus also reported a case

in which ephedrine was given after operation for acute pancreatitis, when the patient appeared to be dying, ephedrine, in a dosage of 6 cgm daily for four days, brought about complete recovery. Other authors have used adrenaline.

Ephedrine and adrenaline are usually employed as adjuvants to surgery in acute pancreatitis, but in one of the authors' cases, as noted, ephedrine was effective in relieving the symptoms and evidently causing regression of the pancreatitis without surgery. A dose of 8 cgm daily was necessary in this case. In order for ephedrine or adrenaline to be effective in acute pancreatitis, large doses must be used, much larger than those usually employed in therapeutics, (the authors have never observed any signs of intolerance to the drug in these cases). Both drugs must be given by injection and the treatment must be continued for several days in order to obtain the best results. Couvclaure has shown that the initial lesion of acute pancreatitis is edema of the pancreas and of the surrounding peritoneum. Ephedrine or adrenaline reduce this edema, this action of adrenaline has been observed in 1 case at operation, as noted by Chapuis in his thesis in 1937, in which he quotes an unpublished report by Henry.

ALICE M. MEYERS

Kauer, J. T., and Glenn, F. Carcinoma of the Pancreas. *Arch. Surg.*, 1941, 42: 141.

A statistical study of 32 proved cases of carcinoma of the pancreas admitted to the New York Hospital over a seven year period is presented. The incidence of this lesion was 1 in every 752 admissions. The disease occurred in men more than twice as frequently as in women.

The symptoms most commonly found were pain, jaundice, and loss of weight. It is of interest to note that pain was the most common complaint, and the authors point out the error of the phrase "painless jaundice" so often found in textbook descriptions of the clinical findings. The pain is usually described as dull and boring, often going through to the back.

The most common finding on physical examination was jaundice. The liver was enlarged in about half of the cases and the gall bladder was palpable in one third.

Gastric hypo acidity and anacidity were frequently present. Roentgenological examination proved of little diagnostic value. Examination of the stools for fat offered one of the most useful indexes for determining the absence of pancreatic juice in the intestinal tract.

Twenty three of the 32 patients were subjected to operation, the majority of the operations being of an exploratory or palliative type only. Cholecystogastrostomy was performed in 9 cases, cholecystoduodenostomy in 1 case, and cholecystectomy plus choledochotomy in 1 case. The conclusion was drawn that palliative operations did not prolong life in the group as a whole.

Cancer was found to be located in the head of the pancreas in 23 cases, in the head and body in 4 in

the body and tail in 4 and in the entire gland in cases. The total average duration of the disease about nine months from the onset of symptoms.

A one-stage radical type of pancreaticogastrostomy is suggested in favorable cases, but as yet it has not been performed on human beings.

LESTER H. WOLFF, M.D.

MISCELLANEOUS

Dorling, G. C., and Eckhoff, N. L. Chemotherapy of Abdominal Actinomycosis. *Lancet* 949: 597-707.

The usual course of actinomycosis infection of the abdomen is a discouraging downhill one, with the development of multiple fistulas usually terminating fatally. In 1937 the first reports of cases of this disease which responded to chemotherapy with sulfonamide drugs appeared. Since then a number of other cases have also appeared. To these are added the authors' 5 cases 4 of which showed complete recovery.

Abdominal actinomycosis usually follows an operation for gangrenous or ruptured appendix. At least this is the initiating factor in all these cases. The diagnoses were confirmed in all instances by culture which showed the presence of actinomycosis. In the earlier cases the use of the sulfonamide drugs was started relatively late, but as the authors gained experience they tended to use them earlier. Both sulfanilamide and sulfathiazole have been used in amounts of from 3 to 4 gm. daily. The total amounts used varied from 33 gm. in an eight-year-old child, up to 6 gm. with this treatment. There was marked amelioration in the symptoms, and in cases in which operations were subsequently carried out, all evidence of the actinomycosis infection had disappeared.

The authors conclude with the following statement: Chemotherapy should be tried early in all cases of suspected abdominal actinomycosis. Two or three courses of sulfapyridine each lasting a week and with rest between are usually needed.

JOHN W. EATON, M.D.

GYNECOLOGY

ADNEXAL AND PERIUTERINE CONDITIONS

Lajos, L. Concerning Giant Ovarian Cysts (Ueber die Riesenovarialsysten) *Geburtsh u Frauenheilk*, 1940, 2 475

After allusion to the criteria by which Kehrer collected 100 giant ovarian cysts from the world literature covering the interval from 1873 to 1928, the author describes a personally observed case of such a tumor in a sixty-year-old nullipara. This tumor, as usual, exhibited a slow growth and first produced pain in the last two months after undergoing a considerable increase in size. It had a girth of 138 cm and a weight of 94 kgm. After the diagnosis of pseudomucinous cyst of the ovary, a laparotomy was performed under chlor ethyl ether anesthesia and after puncture and the slow removal of 42 liters of fluid, the tumor which had developed partly within the ligament was removed. A supravaginal amputation of the myomatous uterus was also performed. Doses of digicharin were given to increase the strength of the heart. Weight of the tumor with the fluid was 46 kgm, therefore, it was almost half the weight before operation.

The considerable emaciation in consequence of the loss of protein and other nutrients in the cystic fluid made necessary a differential diagnosis between Simmonds' dystrophy due to a deficit in the activity of the pituitary gland since both clinical entities can occur together. Both of these conditions can produce thinning and loss of elasticity of the abdominal wall, edema, and venous dilatation. Compression phenomena of the thoracic organs due to elevation of the diaphragm and compression phenomena of the bowels are the results of such giant tumors that make necessary prompt treatment. (Puncture, cautious removal of fluid with observation of the heart and circulation, as well as extirpation of the tumor)

Merely repeated punctures do not achieve the purpose but spoil the chances of a later radical operation because of subsequent scarring. The author does not remove the cyst as a whole, because of the large incision necessitated thereby and the great danger of shock and peritonitis which would result therefrom. One difficulty of the operation which is important is the not infrequent intra ligamentous development of the tumor and the abundant adhesions which eventually make removal of the emptied cyst impossible. In such a case, the wall of the tumor must be sewed to the abdominal wall and its cavity obliterated by the use of a Mikulicz drain. Since death is due primarily to heart failure and secondarily to peritonitis, sepsis, or ileus, the importance of one or two days of pre-operative treatment of the patient with cardiaca should be stressed if the condition permits. After operation this medication should be continued for a long time. Furthermore, it is necessary to accomplish the laparotomy with the smallest possible incision, with careful asepsis, and complete peritonealization of the wound surfaces.

At the conclusion of the work the author shows by a table that in operations for ovarian cysts weighing between 50 and 100 kgm the mortality amounts to 25 per cent, while for cysts under this weight the mortality is only 6.52 per cent. Death as a consequence of heart failure occurs without exception only when the ovarian cysts weigh more than 50 kgm.

(HARLHEINZ SOMMER) JOHN R. PAINE, M.D.

EXTERNAL GENITALIA

Farsht, I. J. Suprapubic Transvesical Repair of Vesicovaginal Fistulas. *J Urol*, 1940, 44 279

A method of repair of vesicovaginal fistulas by the suprapubic transvesical route is described, and

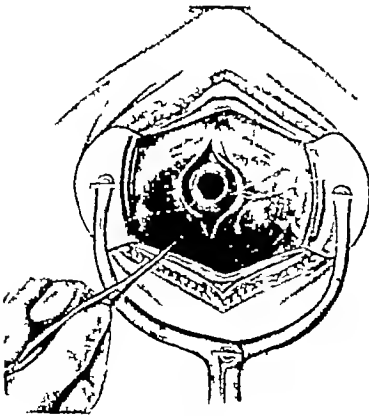


Fig 1

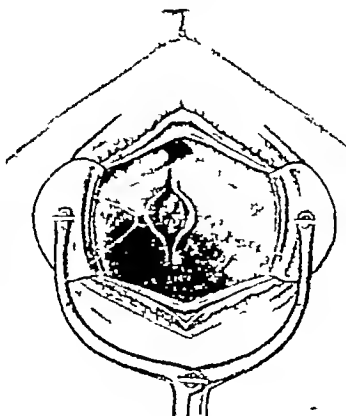


Fig 2

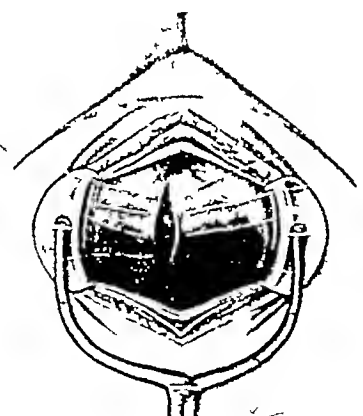


Fig 3

an analysis of 20 cases is reported by the author. He concludes that vesicovaginal fistulas of surgical origin are on the increase while those of obstetrical origin are on the decrease.

The fistulas of surgical origin as a rule fixed high up in the vagina and are in close proximity to the ureters. The inaccessibility of these fistulas from the vaginal approach makes their exposure, proper dissection, and repair very difficult.

Good exposure, careful dissection of the fistulous tract, adequate mobilization of the vesical wall, separate suture of the vesical and vaginal orifices, and proper pre-operative and postoperative care are essential for the successful repair of vesicovaginal fistulas.

The suprapubic trans vesical method of approach allows the proper execution of these principles, prevents unsuspected injury to the ureters, and permits suprapubic drainage of the bladder which the author believes is superior to other types of vesical drainage. This approach is also applicable to the majority of lower-lying fistulas which result from obstetrical injury. D. E. MEX MD

MISCELLANEOUS

Seitz, L. The Governing of the Reproductive Processes by the Sex Hormones in the Female—Hormonal Sexual System (Die Steuerung der Fortpflanzungsorgane durch die Geschlechtshormone bei der Frau (hormonales Geschlechtssystem)). *Deutsche med. Wochenschr.* 9:10. 76

It is always stimulating and enjoyable to read the work of Seitz concerning hormonal studies. The present review represents a small section of the thoughts which the author has developed much more completely in his monograph on the subject.

Seitz discusses the basic problem of the reproductive processes with great zeal and draws conclusions concerning the generally applicable rules for reproduction both from the phylogenetic and ontogenetic viewpoints which are extremely stimulating and interesting. Aside from this, there is nothing basically new for those who have been engaged with the question of sexual hormones.

The factors which influence the reproductive processes are divided by Seitz into general cell nutritional substances and general cell-stimulating substances just as the substances through which evolution and function of the gonadal glands are specifically influenced. The author then presents detailed discussion concerning these two factors which extends into the general realm of endocrinology as well as the realm of vitamins. The presentation of the tasks and functions of the sex-specific hormones, including those which are formed by the placenta during pregnancy (hormonal hormones) takes up the greatest part of the discussion.

The conclusions drawn are for the most part teleological in character because the experimental bases for the conclusions still frequently present definite defects.

The author labels the entire combined system of the sexual and reproductive process Hormonal Sexual System, which from cellular humoral aspect is composed of three parts: (1) the cells which form the sex hormones and the gonadotropic elements, (2) the sex-specific elements themselves and (3) the resulting cells which respond to the influences of these hormones in a specifically elective manner. The author parallels his system to the reticulo-endothelial system of Aschoff which latter has its purpose the protection of the individual from damaging influences. In other words, its purpose is to sustain the individual upon the hormonal sexual system rests the responsibility of sustaining the species. The event that this system fails in any of its particular parts, the prospects of therapy are for the most part not very favorable. This is true especially if the disturbances have their origin in the hypophysis because we yet know very little about the chemical construction of this hormone and because its action is exerted over the midbrain the functions of which are also not very well known. In treating this type of disturbance one must possess the ability to comprehend the entire problem in order not to be left depending upon some isolated symptom.

(F. SEITZ) MD A. STERN MD

Lowenstam, W. J. Treatment with Sulfasilamide Preparations in the Women. *Clinic in Bergen* (Behandling med sulfasilamidpræparater i det Kvindesjælsk i Bergen). *Nord. Med.* 94:9, p. 91.

During the year 1935-36 patients are treated in the Women's Clinic in Bergen with the sulfasilamide preparations—protonal, St. and B. 603, and streptan (Norwegian preparation). A good result was achieved in 35 per cent among series of 43 cases of puerperal infection and probably good result in another 33 per cent only patients were not cured on discharge from the hospital. The control material consisted of 48 similar cases which were seen in 1937. Twenty of these patients are cured on discharge from the hospital, 5 were incompletely cured, and 3 died. Nine cases of thrombophlebitis are not affected by the treatment. I prophylactic treatment, which is recommended in complicated cases with intra-uterine intervention, hemorrhage, or premature escape of the amniotic fluid, too small dosage must not be given as it is very ineffective and may possibly result in resumption of sulfasilamide. 1 of 5 cases of infected abortion, good result as observed the best results are obtained with large doses. 1 case of gynecological operation with infection, all of which are cured, and in 4 cases of malaria the effect of the drug not certain. Of 37 cases of pneumonia 3 are cured, the sample series of treatment is, 3 after repeated treatments. Among 5 cases treated with sulfa and hexamethylentetrazolol are cured.

On comparing the preparations, St. and B. 603 seemed to give the best result. The dosage is 4 tablets of 1 gm. for the first dose and then 2 tablets

every fourth hour during the entire day for the first three days. The next three days, two thirds or one-half of this dose is given every fourth hour, except at night. The associated effects were as follows: nausea occurred in almost all of the 41 cases, in 10 there was vomiting and in 1 an exanthem. Among the 70 patients treated with streptan 1 had nausea, 1 vomiting, and 2 urticaria. Prontosil, which was used in 25 cases, produced vomiting in 2, icterus in 2, and exanthem in 1.

(AXEL OLSEN) LOUIS NEUWELT, M D

Bracht Thrombosis and Embolism in Gynecology
(Thrombose und Embohe in der Frauenheilkunde)
Deutsche med Wchschr, 1940, 2 1014

According to almost all statistics, the highest figures for thrombosis and embolism are found in gynecological operations. In the order of importance the operations are for carcinoma of the uterus and ovaries, and for myomas, exploratory laparotomies, and vaginal operations. Obstetrics also includes puerperal thromboses and embolism. Abdominal section gives the greatest incidence and this is followed by manual freeing of the placenta and palpation of the placenta.

Statistics covering 3,000 births showed that among 691 operative cases (including episiotomy and perineal suture) there were 39 cases of thrombosis and 4 or 5 cases of embolism during the puerperium. There was no fatality. The author is of the opinion that the thromboses encountered in obstetrics are, for the most part, of infectious origin. This view is supported by the fact that in 1,033 infected births, there were 58 cases of thrombosis during the puerperium, but no embolism. According to general, accepted evaluations, the percentage of fatal embolism which occurs during the puerperium amounts to 1 per cent.

Among 800 operative gynecological cases (mostly tumor material, not including minor operations) there were 18 thromboses with multiple severe infarcts and 1 fatal embolus, the latter in a fifty-six-year old woman with carcinoma of the ovary. In contradistinction to the obstetrical cases it was found that in operation performed for other infectious conditions (one fourth of the entire operative material), only one ninth as many thromboses occurred.

Among 100 cases of infected cervical carcinoma which were operated according to the vaginal method of Schauta, no thrombosis or embolism occurred. The author attributes this favorable result, for the most part, to the method of anesthesia (caudal anesthesia at the level of the third lumbar vertebra and parasacral anesthesia). The type of anesthesia and the technique of operating are very important factors in the question of thrombosis, although occasionally this fact is underestimated. In the cases of mild thrombosis in the saphenous region the application of a plaster bandage and getting the patient out of bed gave the best therapeutic results. Thrombosis of the femoral vein and thrombophlebitis should be treated by strict bed rest. Sympatol proved of no value prophylactically (Koenig), neither did the raising of the foot of the bed (Schmidt and Reichenberg).

The removal of the thrombus according to the method of Kulenkampf is critically discussed. For the further elucidation of the problem of thrombosis and embolism, it is important to improve the diagnosis of the distant thrombi resulting from stasis and to improve the methods of determining the point of origin of the embolus, and, finally, it is necessary to study thoroughly and explain all cases of fatal embolus with reference to their source and character.

(SAAL) HARRY A. SALZMANN, M D

n analysis of 20 cases is reported by the author. It concludes that vesicovaginal fistulas of surgical origin are on the increase while those of obstetrical origin are on the decrease.

The fistulas of surgical origin are as a rule, fixed high up in the vagina and are in close proximity to the ureters. The inaccessibility of these fistulas from the vaginal approach makes their exposure, proper dissection, and repair very difficult.

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MISCELLANEOUS

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(I. STOKLEY) HILL, A. S. LEX, M.D.

Loewenherm, W. J. Treatment with Sulfamylamide Preparations in the Women's Clinic in Bergen (Behandlung mit Sulfamylamidpréparaten in der Frauenklinik in Bergen). Nord. Med. 610, p. 615.

During the year 1935, 36 patients were treated at the Women's Clinic in Bergen with the sulfamylamide preparations—protonil, M and B 603, and streptan (Norwegian preparation). A good result was achieved in 33 per cent among a series of 43 cases of puerperal infection and probably good result in another 33 per cent only. Patients are not cured on discharge from the hospital. The control material consisted of 48 similar cases which were seen. Of 937 patients of these patients are cured on discharge from the hospital, 5 are incompletely cured, and 3 died. Nine cases of thrombophlebitis were not affected by the treatment. Prophylactic treatment which is recommended in complicated cases with intra-uterine intervention, hemorrhage, or premature escape of the amniotic fluid too small.

Dosage must not be given. It may prove ineffective and may possibly result in death due to sulfamylamide. Of 3 cases of infected abortion, good results were observed. The best results are obtained with large doses. Cases of gynecological operations with infection all of which are cured, and 14 cases of mastitis. Effect of the drug not certain. Of 37 cases of pyria, 3 are cured. The sample series of treatments, 3 after repeated treatments. Among 5 cases treated with salol and hexamethyltetraammonium were cured.

On comparing the preparations, M and B 603 seemed to give the best result. The dosage is 1 tablet of 5 gm. for the first dose and then tablets

by homogeneous tissue. The pedicled lobe lay free on the placental surface, and impression traces were not visible on the placenta. Cross sections of the tumor were dark red-brown with grossly visible vessel lumens. In some places there were shaggy tufts of chorionic villi. Microscopically it showed large and small nodules of tumor tissue which were surrounded by heavy fibrous tissue. In the nodules were capillary spaces lying closely together, the diameter of these spaces was occasionally only that of an erythrocyte and usually wider. The capillaries were lined with hypertrophied endothelial cells with large nuclei which projected into the lumens. The latter were round, oval, or gaping, and often anastomosed with one another. In places there were numerous erythrocytes and a few leucocytes in the lumens, and in other places the capillary spaces were practically empty. The capillary formations were found in a net of fine and coarse edematous connective-tissue fibers where larger nutritive vessels entered. In other areas the capillary spaces were closely pressed together. In the other lobe of the tumor there were areas in the vicinity of the thrombosed vessel in which necrotic tissue with calcium deposits were visible. Here and there the tissue had a myxomatous or myxofibromatous appearance. The chorionic villi showed angiomatous changes, were covered with fibrin, and at no place penetrated into the tumor tissue.

There is no unanimity of opinion as to whether chorio angiomas are true tumors. Many old and new thoughts (Niebergall, Kraus, Ribbert, Hinselmann, Boeki) as to the etiology are advanced. Clinically the chorio angiomas are benign.

The author was able to gather 8 cases of primary malignant tumors of the placenta from the literature, and 3 cases of metastases in other organs. Chorio angiomas are often associated with hydramnion. Bleeding in the post-partum period from chorio angiomas has often been reported.

(JANISCH-RAŠKOVIC) E. S. BURGE, M.D.

Dieckmann, W. J., and Kramer, S. Edema in Pre-Eclampsia and Eclampsia. *Am J Obst & Gynec*, 1941, 41: 1.

The following physiological changes occur in normal pregnancy.

The venous pressure in the legs is increased and causes an increased loss of fluid from the blood, which fluid enters the tissues of the legs. There is an increased capillary permeability. The elimination of water and solids by the kidney is delayed or impaired. The average serum protein concentration is 6.5 gm per cent. The average colloid osmotic pressure of the serum protein is 28.7 cm of water.

Pre-eclampsia and eclampsia may occur if these changes are of greater magnitude than normal, or if they are exaggerated by internal or external factors. Thus, the following changes are found in these cases:

greater alterations than normal occur in venous capillary pressures and capillary permeability.

The average serum-protein concentration in edematous patients with pre-eclampsia is 6.22, with eclampsia it is 6.7, and with vasculorenal disease and normal renal function it is 6.67 gm per cent. The average colloid osmotic pressure of edematous pre-eclamptic patients is 24.9, and of toxemic patients without edema 26.5 cm of water. The retention of sodium, chlorine, and water is greatly increased in some pregnant patients, which results in an abnormal gain in weight and, finally, in demonstrable edema. Changes in the concentration of the female hormones are apparently associated with edema, but whether this is the cause or the result cannot be stated from our present knowledge. The prevention and treatment of edema are dependent on the limitation in the diet of the principal components of edema fluid, namely, sodium chloride and water. The curtailment of sodium chloride in the diet presents fewer difficulties and causes less discomfort to the patient than the restriction of water.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Daron, D. Administration of Carbon Dioxide for the Induction and Acceleration of Labor (Die Anwendung der Kohlensäure als neue, die Geburtstätigkeit erregende und beschleunigende Provokationsmethode). *1. knf i Ginek*, 1940, 6: 31.

Of all the methods devised for the induction and stimulation of labor, Brown Sequard's theory of uterine asphyxiation deserves special consideration. According to the procedure of Thaler, who for some years has made use of carbon dioxide inhalations for stimulation of labor, a mixture of 80 per cent air, 5 per cent carbon dioxide, and 15 per cent oxygen was used. The inhalation was continued for four or five minutes and if necessary was repeated with a double quantity of carbon dioxide after from twenty-five to thirty minutes. Improved uterine activity was obtained in nearly all the cases by the use of this method. In 1 case of delayed expulsion of the placenta due to uterine atony, the placenta was expelled twelve minutes after the inhalation of carbon dioxide (VON SCHROEDER) EDITH SCHANCHF MOORE.

Kaufmann, D. The Significance of Manual Dilatation in the Treatment of Functional Soft Part Impediments to Delivery (Die Bedeutung manuelle Dilatationsmethoden fuer die Behandlung funktioneller Weichteilschwierigkeiten unter der Geburt). *Zurich Dissertation*, 1939.

First, a classification of the functional difficulties caused by the soft parts in dilatation is given, and then the author considers the consequences of these difficulties attendant upon the mother and child. A short summary of the usual methods of dilatation is given. The author's conclusions drawn from approximately 5,000 cases seen in five years were that 7.3 per cent of these presented functional perineal difficulties which demanded treatment by manual dilatation, two thirds being cervical and

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Tachewitz, E., and Engelhardt, E. New Aspect Concerning the Question of Protracted Pregnancy (Neue Gesichtspunkte in der Frage der übertragenden Schwangerschaft) *Munchen. med. Wochenschr.* 940, 996.

After the authors refer to the significance of the menstrual status for the calculation of the normal termination of pregnancy, they emphasize the danger to the life of the child in actual protraction of pregnancy beyond term. In 17 cases in which the calculated term had been exceeded by at least ten days the fetal mortality amounted to 7 per cent. This danger particularly involves male fetuses, for which there exists a marked tendency to carrying beyond term (among 11 children carried beyond term, there were 800 boys and 4 girls). The male fetus is also more often endangered by complications during delivery; thus in this series, 6 cases of fetal death occurred in protracted pregnancies, 5 of the fetuses being male. In older primiparas the involvement of the male fetus carried beyond term is especially marked, the fetal mortality in this group being 9 per cent.

The roentgenological determination of the size of certain bone centers is recommended as an aid in the diagnosis of protracted pregnancy beyond term. Special significance in this respect is attributed to the proximal center of the tibia, which was found to have a minimal diameter of 7 mm. only in children who had been carried beyond term. Furthermore the size of this center can be determined roentgenologically while the fetus is still in the uterus.

On the basis of the authors' experience, attention is called to the value of this observation for clinical obstetrics. The currently existing opinion that the cause of prolongation of pregnancy is supposed to be based upon an abnormal relationship between the follicular hormone formed in the placenta and the corpus luteum hormone, was born out by the fact that the determination of the placental hormone in the case described yielded subnormal values (from 800 to 1,000 mouse units).

(TACHOWITZ) II 1111 V 54 LINE 1, 11 D

Dippel, A. L., and Brown, W. H. Roentgen Visualization of the Placenta by Soft Tissue Techniques. *Am. J. Obst. & Gynec.* 940, 4 980

The placenta was clearly visualized by soft-tissue roentgenography in 36 (90 per cent) of 40 observations on 59 patients in 26 pregnancies. The greatest factor interfering with visualization was found to be hydramnios, which accounted for non-visualization in 5.73 per cent of the roentgenograms. Unsatisfactory films are obtained in 5 per cent of the cases, and it was impossible to visualize the placenta in 1 of 8 cases of pregnancy immaturity

provided the pregnancy had advanced beyond the midpoint, and abnormal presentations and positions are not hindering factors in visualization.

Calcification of the placenta is rarely extensive enough to aid in localization of the placental site. No other adjuncts to actual visualization are found. Fetal position is not a reliable criterion of the location of the placenta. No errors in roentgenological localization of the placenta were found in the 53 instances which were checked by reliable clinical methods. The placental implantations were almost equally divided between the anterior and posterior walls of the uterus. However, its low implantation, essentially eight times as many placentas were found implanted on the anterior on the posterior all of the lower uterine segment. The average thickness of the l¹s of the fundus uteri near term measured 24 cm. on the roentgenograms which were made at distance of 4 in. Only 1 (1 per cent) of 9 patients with vaginal bleeding were found roentgenographically and clinically to have true placenta previa; 5 others presented merely as evidence of low implantation of the placenta, like out the usual clinical signs.

Soft tissue roentgenography in obstetrics finds its greatest usefulness in those cases of vaginal bleeding in which the whole of the placenta can be visualized above the level of the ischial crests and thus constitute to the great majority (83 per cent) of the instances of vaginal bleeding in the latter months of pregnancy.

EDWARD L. CORNELL, M.D.

Stancik, I. Benign Tumors of the Placenta (Gutige Tumoren der Placenta) *Bratislav. lek. Listy* 940, 20 8

The first description of placental tumor comes from Clark (1783). According to Leopold they occur once in 8,000 births. According to Clark and Frazer they derive from elements of the chorionic vessels. In 903 Dismal collected all the cases described in the literature, subjected them to criticism, and suggested the term chorionoma angiomatous or fibromatous. The author describes the macroscopic appearance, microscopic structure and origin of these particular tumors. They are recorded in the literature. Some authors stated that they could find no angioneuromas. Others disagreed with this statement.

The author gave as his that of primipara who never suffered any circulatory disturbance. She had spontaneous delivery with drainage and no postpartum hemorrhage. The placental tumor occurred 4 cm. from the umbilical insertion and consisted of 2 lobes. One lobe was 4 cm. perlebe formed of three vessels and contained embryonic tissue. One of these vessels thrombosed. The largest vessel led into the umbilical vein, cm. from the insertion of the cord. Both lobes consisted of and were connected

THE CLINICAL MANAGEMENT OF RENAL TRAUMA

Collective Review

JOHN G. CHILTHAM, M.D., F.A.C.S., Portland, Oregon

A SURVIVAL of the recent literature shows several newer developments in the clinical management of renal trauma. We wish to draw especial attention to the following features. Excretory urography, as well as retrograde pyelography, are important factors in the diagnosis and follow-up of cases of renal trauma. There is a growing trend to conservatism in the management of the case, and a tendency toward greater conservatism in the type of surgical procedure used. The prognosis has been improved with the newer urinary antiseptics. There is also better understanding of and improved treatment for the aftermath of the trauma because of their mobility and position, being protected by the lower ribs and spinal muscles, the kidneys are but rarely injured, yet it is worthy of note that about 8 per cent of the surgery of the kidney is due directly to trauma. When we consider the delayed results of trauma as well, this percentage becomes considerably greater.

On account of greater vocational exposure to trauma as well as the lesser anatomical protection afforded, injuries to the kidneys are more common in the male than in the female, roughly in the ratio of 6 to 1. Because of the greater infantile renal ptosis, sparsity of perirenal fat, and the greater tenseness of the peritoneum, trauma is, relatively speaking, more common in children than in adults. By reason of its lower position, the right kidney is more often affected than the left. Bilateral rupture is extremely rare.

While the importance of preexisting pathological lesions has been minimized by some, others believe that such conditions may be predisposing causes. It is reasonable to presume that hydro-nephrosis or pyonephrosis, congenital anomalies, abscess, tuberculosis, carcinoma, and chronic pyelonephritis might be contributory in that a lesser trauma would be necessary to cause a rupture. Ectopia, and stricture or kinking of the ureter, or any type of obstruction causing hydraulic back pressure and interfering with normal drainage might also fit into this group.

Injuries to the kidneys are commonly classified as closed or open. The former may be due to direct or indirect trauma. Campbell analyzes the mechanics of rupture of the kidney as follows:

The blood in the encapsulated organ subjected to a sudden blow, in accordance with the law of hydrostatics, transmits that blow equally in all directions throughout the mass, and varying degrees of trauma may produce results varying from minor lacerations to complete explosion of the viscus. Blows to the loin or abdomen may push the kidney against the last rib which acts as a fulcrum over which the organ may be contused or lacerated. With a lumbar blow, the lower ribs may be pushed directly against the kidney, or this organ may be impounded against the liver. Lateral blows may cause a crushing of the kidney against the spine or transverse processes. Further, the kidney may be injured by penetration by fractured vertebrae, ribs or pelvic bones.

The application of indirect force may also result in acute rupture of the kidney. In addition, this organ may be dislocated as the result of the pull on its attachments, or it may even be broken off at the pedicle. Further, and particularly when the body is in a flexed position, upon sudden muscular exertion a contraction of the diaphragm or of the abdominal or lumbar muscles may thrust the kidney against the spine, the ribs, or the liver with an ensuing rupture. Cases of this type are infrequent. Rupture of the contralateral kidney by the mechanics explained is quite rare.

The other group of renal injuries is of the open or penetrating type. These may be caused by knife, sword, bullet, or other projectiles, and the extent of the injury may vary from minor punctures to extensive ruptures or lacerations.

In addition, a further group involves the trauma due to instrumental or surgical procedures. Through use of the cystoscope, injury may occur in the form of penetration by either catheter or bougie or it may result from a metal instrument such as might be used to dislocate a stone or to dilate a stricture. Serious injuries have been reported from excessive pressure of the injected media in the taking of retrograde pyelograms. Among the operative injuries have been listed tearing of the vena cava, trauma to aberrant vessels, rupture of the kidney pedicle, tearing of the renal parenchyma, intentional trauma as for nephrostomy, explosion caused by a blood-clot impaction at the ureteropelvic junction, especially after nephro-

one-third in the lower birth canal. Primipara made up the great majority of those presenting this emergency, in the first stage of labor there were 5 per cent of multiparas and in the second stage 10 per cent of multiparas. The average age of the patients requiring dilatation was thirty years, therefore relatively high. In 26.7 per cent of the dilatations of the upper birth canal and in 4 per cent of the pelvic floor and vaginal vault dilatations, there was a slight degree of contracted pelvis which emphasized the importance of the constitutional type in soft-part difficulties. In 34.6 per cent of the cases premature rupture of the membranes was present this occurred in only 30.4 per cent of the total group of deliveries. Ten per cent of the babies weighed over 4,000 gm., 4 per cent over 3,500 gm., and only 5 per cent under 3,000 gm. Abnormal positions were not any more frequent than in spontaneous deliveries.

For the use of manual dilatation exact indications are given. In the first stage of labor it should be used if there has been no progress for several hours under otherwise normal conditions with active labor contractions and the cervix is at least the size of a 5 mark piece (silver dollar). In the second stage it should be used after 4 hours have elapsed under otherwise normal conditions. The author believes that this indication behooves one to be cautious and circum-spect and not to interfere prematurely with the physiological course of labor.

Cases in which the well-being of the mother and child are at stake in which intervention must be made earlier and the dilatation of the pelvic floor must follow swiftly after the stretching of the upper

birth canal to insure the prompt termination of labor are also considered. The prerequisites for manual dilatation are: no disparity between head and pelvis, entry of the presenting part into the pelvis and the size of the cervical os must be that of a 5 mark piece. All other possible remedies should have been tried such as ecbolics and spasmolytics. The dilatation itself is to be regarded as an operation and requires therefore the strictest aseptic preparation.

After these precautions have been taken, the dilatation is performed with the patient in the lithotomy position a pericervical bag of watery solution is ruptured. With one or two fingers the cervix is spread radially in all directions only during a pain. The procedure may be done in general without any anesthesia. In a similar manner the pelvic floor is stretched.

The results from this method are good. The mortality for the mother nil, and for the child 8 per cent (4 deaths of which only one could be ascribed to the procedure). The maternal and fetal morbidity is not higher than in normal deliveries. In 4 per cent of the cases the dilatation procedure is insufficient to bring about the desired early termination of labor. The efficiency of the dilatation procedure lies in the abbreviation of labor, thereby the potential dangers for mother and child in protracted birth is avoided. Furthermore many more extensive vaginal operations are in this way rendered unnecessary. There is but slight danger of infection and injury of the soft parts if the method of aseptic technique is strictly observed.

(Kinnear) E. S. B. and M. D.

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lithotomy and, also injuries to the diaphragm, pleura, and peritoneum.

Numerous classifications of the different types of ruptured kidney have been propounded. We will follow that of Gutierrez. He designates the following main types of lesion:

1. Rupture of the true capsule, with or without accompanying rupture of the parenchyma.

2. Rupture of the kidney parenchyma, with or without rupture of the capsule. The lesions without rupture of the capsule may or may not communicate with the pelvis or calyces. Those with rupture of the capsule show a variety of types: stellate rupture, fragmentation, perinephritic hematoma without hematuria, and those lesions in which hematuria occurs as the result of communication with the excretory apparatus.

3. Rupture of the excretory apparatus of the kidney may include the rupture of a calyx with rupture of the renal parenchyma and the formation of a pseudohydronephrosis or there may be simple rupture of a calyx and its papilla causing hematuria. With or without rupture of the kidney parenchyma, there may occur a rupture of the pelvis, accompanied by infiltration of urine, hematoma, or perinephritic abscess. There may be a rupture of the ureter at any level with or without rupture of the renal parenchyma, but in any event with an infiltration of urine.

4. Rupture of the blood supply of the kidney. This may be in association with an aneurysm of the renal artery, a rupture of the renal artery or renal veins, or a partial or complete tear of the renal pedicle.

5. Rupture of the surrounding tissues and neighboring organs may result in the formation of a perirenal hematoma, and if infection occurs a perinephritic abscess or a fistulous tract to neighboring organs may develop. Such might originate from rupture of the fatty capsule or from trauma to muscle or to the adrenal gland.

6. Rupture of the kidney into the subphrenic or thoracic organs. Rupture of the kidney may occur intrathoracically from a subphrenic or pleurobronchial lumbar fistula, or intraperitoneally from a fistula into the stomach, duodenum or colon. It should be pointed out that the diseased kidney, as in tuberculosis, tumors, nephrolithiasis, or pyonephrosis, is more apt to rupture than the normal.

If the capsule is ruptured, escape of blood into the perirenal tissues with the formation of a hematoma is the rule, the size of the latter depending on the site of rupture and the severity of bleeding. Rupture of a renal blood vessel may also cause hematoma. As the latter grows, the bleed-

ing may be partially or completely arrested by increased pressure on the kidney and surrounding tissues. If the parenchyma only is injured, there is no escape of urine into the surrounding tissues, but if a calyx, the pelvis, or the ureter is ruptured, urinary extravasation results. (Wesson states that urine in the cellular tissue always indicates a torn pelvis or a ruptured calyx, since lacerated renal substance is not capable of secreting urine.) If this urine is small in amount and uninfected, it may be absorbed, but if it is of large amount or if infected with pathogenic organisms, perinephritis or a perinephritic abscess usually occurs. Abeshouse has collected 64 cases in which the rupture was of the pelvis only without damage to the renal parenchyma. He notes that previous renal disease tends to the occurrence of such an injury.

Among the various factors complicating the picture of ruptured kidney are infection in the kidney itself or in the surrounding tissues, and hydronephrosis due to injury or obstruction of the ureter with resultant stasis in the renal pelvis. And, in addition, there may be fractures of the bony structures, rupture of the peritoneum, and injuries of other visceral organs, especially the spleen and liver. Such may be of even greater import than the injury to the kidney itself.

Open wounds may give a quite similar picture, but are often complicated by the introduction of foreign material. A bullet wound is apt to be penetrating, while that caused by a larger projectile is frequently of the stellate type. Wounds from such sources are usually associated with injuries to other organs or to the peritoneum or pleura.

According to Wesson the mechanism of wound repair in the kidney is similar to that in any other parenchymatous organ. With the aid of a blood clot the proliferation of the interstitial connective tissue bridges the gap between the edges of the wound. The functional elements of the organ degenerate and are replaced by connective tissue. Scar formation in the kidney is rapid, and the process of repair shows marked advance in the course of few days. The parenchyma is replaced by scar tissue through which scant newly formed capillaries slowly permeate. There is no regeneration of the highly specialized tubules or glomeruli of the kidney. When the ruptures are numerous or extensive excystation may cause a widespread fibrosis with ultimate atrophy of the kidney.

Hematuria is the most prominent symptom of injury of the urinary tract. It occurs in about 90 per cent of all cases of renal trauma. It may not occur when the injury is slight or when the rupture is not in communication with the excretory

apparatus. It may also be absent if the ureter or if the renal pedicle is completely torn, or if blood clots occlude the ureter. Hematuria, when present, is usually noticed at the first voiding following the injury, but may be delayed for several days. In amount it may be microscopic or profuse. Its duration may be very short, or it may be prolonged over a considerable period of time. When infection is present there is usually an associated pyuria.

When the injury is slight, tenderness only may be present in the general area of the trauma or about the kidney region, but pain is usually present, and varies in degree from moderate discomfort to intense agony. It is commonly increased by motion and by respiration and is localized chiefly to the area of the loin or of the upper abdomen of the same side, rarely is it contralateral. It may be due to contusion of the soft parts, to hematoma formation, or to a pull on the nerve-containing area of the renal pedicle. Colicky pain may result from the passage of blood clots down the ureter. An immediate, sharp, acute pain is fairly characteristic of rupture of the pelvis only.

Following injury of the kidney one may be able to palpate a mass of variable size in the renal area. This mass results from the accumulation of blood and/or urine in the perinephritic tissues, and may form a hematoma or a pseudohydronephrosis, and in the presence of infection, a perirenal cellulitis or a perinephritic abscess may result. The mass is ordinarily fixed, tender to pressure, and usually accompanied by a localized rigidity of the abdominal muscles, frequently associated with a flexion of the leg on the corresponding side. A more generalized rigidity is more apt to indicate extravasation of blood or urine into the abdominal cavity. The mass may develop with great rapidity, or it may form quite slowly, and in a general way, its size may be considered as an index to the degree of severity of the injury. In the absence of responsible factors no mass may develop.

Some diminution in the amount of urine passed is usually noted immediately following renal trauma. This is due to temporary suppression by the injured organ of secretion. It may also result from partial ureteral occlusion by blood clots or from injury to the ureter on the affected side. Complete anuria is not usual unless there is bilateral renal or ureteral injury. However, cases have been reported in which a reflex anuria with inhibition of secretion of the opposite side has been of such severity as to be the cause of death. Complete anuria might also be caused by injury to a solitary kidney or ureter. Blood clots forming in the bladder may cause a partial or complete re-

tention of urine by obstruction of the bladder neck or urethra.

While nausea and vomiting may occur without shock, yet if the injury be severe the latter will usually develop. Immediate shock is regarded as due to injury to the nerve plexuses. However, shock which occurs after a lapse of several hours is usually resultant to extensive and persistent hemorrhage. Increasing anemia is indicated by a rapidly lowering blood count and hemoglobin determination. Infection is usually accompanied by fever, chills, and an increased leucocytosis.

Gastro-intestinal symptoms are usually reflex, resultant to trauma to the celiac plexus. If the peritoneum has been torn, blood and urine, or both, may flow into the peritoneal cavity, and in addition to the signs of internal hemorrhage, peritonitis may develop. This is rarely evident before twenty-four hours following injury. Even without such injury to the peritoneum, severe kidney injuries with shock may be accompanied by the so-called "renal ileus." In addition, injury of the various intra-abdominal viscera may still further complicate the picture. The differential diagnosis is sometimes very difficult, and a study of selected cases will emphasize the need of complete urological and urographic study.

Diagnosis involves not only the question of whether there is a renal injury, but includes also the problem of the determination of the site and extent of the trauma. Is hematuria, admittedly the cardinal symptom of renal injury, due to a traumatic lesion of the kidney itself, or is it resultant to an aggravation by the injury of a pre-existing pathological condition? Might hematuria in microscopic quantities be due to a condition not aggravated by, but brought to light by the examination incidental to trauma? The settlement of these questions depends upon a study of the data supplied by the history, by the symptoms, and by the general and special urological examinations made.

The history tells of the immediate accident, of the direction of the force, or of the type of penetrating instrument, and it may reveal a story of previous trouble, such as calculi or nephritis.

With or without external evidence of injury, a story of trauma with pain and tenderness in the kidney area and with hematuria makes us reasonably sure that there has been a definite renal injury. Palpation may reveal tenderness in the upper abdomen or in the lumbar region on the injured side, and deep costovertebral tenderness may also be elicited. The presence of oncoming muscular rigidity is suggestive. Palpation further reveals the size and extent of a developing hema-

toma which, if large always indicates severe hemorrhage. In the presence of muscular rigidity percussion may help to outline the hematoma. It may determine also the presence of shifting abdominal dullness.

Urinalysis indicates the presence and extent of blood in the urine. It will also reveal the presence of pus or other evidence of urinary infection. A lowering of hemoglobin and of the blood count on repeated examinations is indicative of continued hemorrhage. In the interpretation the question of dehydration should be taken into account. While enlargement of the kidney shadow might indicate subcapsular hematoma while distortion of the kidney shadow might indicate rupture and hematoma formation and while a hematoma itself will sometimes tend to obscure the kidney outline, fade the line of the psoas, and occasionally cause a curvature of the spine, as frequently seen in cases of perinephritic abscess, a plain roentgenogram does not ordinarily give conclusive diagnostic evidence. Outline often details are obscured by the gas associated with a developing focus. The roentgenogram is, however, of considerable value in portraying associated skeletal lesions.

Cystoscopy, pyelography and urography are the special urological examinations on which we rely for a complete and accurate diagnosis. Cystoscopy may be contraindicated when the condition of the patient is such that immediate surgical interference is indicated. It could be omitted also, in those cases of very evident minimal trauma. It is of especial importance in ruling out possible trauma of the lower urinary tract. Combined with intravenous injection of indigo-carmin it may afford valuable information relative to the functional activity of the injured or of the uninjured kidney.

Cystoscopy with retrol catheterization and retrograde pyelograms is called for in certain cases in which operation may be anticipated. The source of bleeding, the functional and anatomical condition of the uninjured kidney and sometimes of the injured kidney as well, can be determined. Objections to this procedure have been voiced because of the increased bleeding elicited by the ureteral catheter and because of the possibility of the introduction of infection, but there is little evidence to support these claims.

Before nephrectomy is done the condition of the opposite kidney must be definitely ascertained, and if retrograde pyelography is not in order intravenous pyelograms may be of great value. Intravenous pyelography is becoming accepted as routine measure in every case of potential injury of the kidney and it doubtless, should

be repeated. In the absence of shock this may be done immediately. The urogram may fail to show the kidney on the side of the injury but the presence or absence of a functioning organ on the other side will be disclosed. Failure to visualize the injured kidney in the early stage is due to the fact that the injured and bleeding kidney may not secrete urine. In interpreting these urograms, reflex suppression of the secretion of the uninjured kidney and the occurrence of solitary kidney must be remembered. It is often of value to check the findings of excretory urography with those of retrograde pyelography. These two procedures are of paramount importance in determining the presence and extent of injury. In following the course of the case treated conservatively in the follow up of the postoperative case especially when conservative surgery has been used and in the study of the late complications and sequelae which so frequently occur.

The treatment of traumatic injury of the kidney is classified as expectant or medical, and as surgical. The expectant or medical treatment is indicated in those cases in which constitutional symptoms are slight or absent, in which hematuria is the main symptom and in which pyelography exhibits no extravasation. This expectant treatment consists essentially of rest in bed with mobilization of the injured parts, ice packs applied locally to the region of the kidney and fluids and urinary antheptics administered orally. Hemostatics which do not tend to raise the blood pressure may be prescribed. Catheterization is called for when obstruction develops in the lower urinary tract. Under such treatment many patients, probably the majority recover with an approximate restoration to normal of the affected parts. In these cases, on account of the complications which so frequently develop, follow-up urographic studies are urgently indicated.

Other cases do not respond so satisfactorily and in these exploratory operation becomes necessary with local and general conditions determining the type of operation to be done. In the presence of immediate or delayed severe hemorrhage and with the development of an increasing hematoma, especially when accompanied by irregular fever and general signs of sepsis, exploration is warranted. In such cases there is usually a fall in blood pressure, rising pulse rate, decreasing hemoglobin determination, and an unsatisfactory general condition. The development of peritonitis, and the presence of persistent anuria also call for operative procedures. In general, in the management of the acute case it is usually not indicated to operate in the first few hours when

the patient is in severe shock, or when there are signs of rupture of the pedicle, of massive hemorrhage, of intraperitoneal involvement, or of injury of other organs. When immediate operation is necessary, such should be done only with accompanying stimulation to combat the existing shock. A careful balance must be struck as the majority of the operative deaths are due on the one hand to the severity of the primary injury, and on the other to procrastination in exploration.

For a not too severely damaged kidney or one with only a torn capsule, conservative surgery may be in order. The use of a tampon to control the bleeding may be sufficient. By some the tampon is condemned, as it is believed that it may lead to the formation of a permanent fistula, and in its place the use of a Mikulicz drain is recommended. This operation may also be indicated when the organ is more severely ruptured and when access to the renal pedicle is difficult, or when the patient's condition is quite critical. In this case, we would contemplate a secondary nephrectomy at a later date. A mild or moderately ruptured kidney may also be repaired by suture as one would do in nephrostomy. In many cases the use of ribbon catgut for tissue approximation has proved satisfactory. In other cases a partial resection or a classical heminephrectomy may fulfill the therapeutic requirements.

When nephrectomy is called for it is always essential to ascertain the condition of the other kidney. Cystoscopic studies may give this information, but are sometimes contraindicated when the patient's condition is critical. Excretory pyelograms may be diagnostic, but in an emergency it is always possible to open the peritoneum and palpate the opposite kidney. Complete nephrectomy is called for in cases of extensive destruction of the renal tissue and in cases with multiple deep lacerations. It is called for when the pedicle has been grossly torn or injured. It is further indicated with irreparable injuries to the kidney pelvis or ureter, and in cases with persistent or secondary hemorrhage. Because of shock and of exsanguination of the patient generally, and because of friable tissues, massive hematoma, and urinary extravasation locally, nephrectomy carries with it a certain hazard. If the kidney, as we have suggested before, is inaccessible, or delivery is difficult, or fresh hemorrhage from manipulation becomes too great, drainage with the placing of tampons, loose closure, and blood transfusion may save the patient. Nephrectomy has certain advantages over conservative surgery in eliminating the possibility of some secondary complications, as persistent urinary sinus, pus formation

about the perirenal tissues, chronic pyelonephritis, continued infection with stone formation, and occasional secondary hemorrhage.

With associated injuries, particularly of the liver and spleen, the abdominal transperitoneal approach by midline or transverse incision is recommended. Abdominal exploration is indicated in those complicated cases in which localizing signs of renal injury, as hematuria, may be absent, and in which we find a condition of shock with vomiting, distention, weak and rapid pulse, perhaps increasing dullness in both flanks, increasing anemia, and often a primary leucocytosis. Severe cases of peritoneal injury rarely come to operation, as the blood escaping into the peritoneal cavity without counterpressure accumulates to the point where death soon ensues. Furthermore, when injury to the intraperitoneal viscera, to the diaphragm, or to the lungs is extensive, the patient usually succumbs quickly. In those cases in which laparotomy is necessary, many authorities recommend doing this part first, and then, when necessary, working on the kidney through a second incision in the lumbar area.

The treatment of external wounds of the kidney depends on the degree of injury and varies from cleaning and dressing to nephrectomy. The great mortality in these cases, which are less frequent than subcutaneous injuries, is due essentially to the frequent accompanying injuries of other organs. Infection is common, and treatment of this factor must be stressed. The symptoms differ in the presence of external hemorrhage and escape of urine from the wound, and in the lack, usually, of hematoma formation. The prognosis in uncomplicated cases is good.

In a study of this type morbidity as well as mortality merits careful consideration. The complications following expectant treatment and conservative surgical treatment of traumatic injury to the kidney are quite numerous. Cicatricial changes may occur which involve the calyces and the pelvis, and fibrotic changes may occur in the renal parenchyma itself. A pyelonephritis may develop and tend to become chronic. This and other septic complications can now be handled more favorably as the result of the recent introduction of more potent urinary antiseptics. This is a topic so vast in extent that we cannot go into detail. We would simply like to point out that, beyond question, mandelic acid and its salts, sulfanilamide, neoprontosil, sulfathiazol and allied compounds, and the revival of the use of nearsphenamine have, in conjunction with the older urinary antiseptics, played an important part in lessening septic complications of renal trauma.



Fig. 1



Fig. 2



Fig. 3

Fig. 1. J. F. female, aged seventeen. Automobile accident. Hematuria, hematomas, rapidly falling blood count and hemoglobin falling general condition. Intravenous pyelography diagnostic. Recovery following nephrectomy for kidney split into approximately equal parts.

Fig. 2. M. R. R., male, aged thirty-two. Fall from height. Shock hematuria hematomas following shock

Retrograde pyelogram shows ruptured kidney on injured side associated pelvic fracture recovery following nephrectomy for grossly infected kidney with multiple and deep lacerations about the lower pole.

Fig. 3. S. R., male, aged seventeen. Severe trauma eight years previously. Slowly increasing dysuria and pain in left kidney area. A functionless, infected hydronephrosis diagnosed. Nephrectomy performed.

Hydronephrosis may develop acutely from the blocking of the ureter by blood clots, but is more apt to develop slowly and chronically. It may result from a more or less complete division of the ureter close to the ureteropelvic junction with resulting stricture formation, but more frequently it is due to a perireteral inflammatory reaction with the formation of strictures, bands, and adhesions, particularly about the upper end of the ureter. Therapeutically it is sufficient sometimes to liberate strictures and adhesive bands, sometimes a plastic operation is called for combined with nephropexy when necessary, and in certain cases—more extensive in type—only nephrectomy will suffice.

Perinephritic changes occur in acute and chronic form. In the acute type there is increased pain, an increase in the size of the hematoma, a rise in the blood count with irregular pulse and fever, and in some cases definite perinephritic abscess formation. Drainage is called for and it should be borne in mind that a secondary nephrectomy may become necessary. In some cases, however, inspection shows that future morbidity will be such that the patient's condition permitting, a primary nephrectomy is more advantageous. On the chronic side we may have the formation of a perirenal collection of fluid following hematoma ab-

sorption, and this may be found between the fibrous capsule and kidney or in the fatty capsule. According to the circumstances, drainage or primary nephrectomy may be in order. Sometimes a secondary nephrectomy has to follow the former.

In other cases fibrous perinephritic changes occur. When marked these may even cause compression and ultimate trophy of the kidney. They are apt to cause chronic pain. When these changes are not too far advanced free liberation of the adhesions, sometimes combined with sympathectomy is the indicated procedure. Traumatic strictures of the ureters are also noted, which, not yielding to cystoscopic treatment, may call for plastic reconstruction or for a nephrectomy. Pyonephrosis may develop, and in turn call for catheter drainage, plastic operation, nephroptomy, and a partial or complete nephrectomy.

What part trauma plays in the etiology of nephroptosis remains debatable, but there would seem to be certain cases of ptosis directly resultant to trauma. In medicolegal and industrial cases it is unfortunate that the burden of proof usually rests on disproving any connection between trauma and the resultant condition. Nephropexy may be called for when the kidney is movable to more than the first degree, and in cases in which pain is prominent feature ureteral lysis



Fig 4



Fig 5



Fig 6

Fig 4 H L, male, aged twenty Motorcycle accident. Hematoma followed by signs of sepsis Loss of kidney outline, obliteration of psoas, concavity of spine to injured side Recovery followed operative drainage

Fig 5 R L J, male, aged twenty five Fall, striking on back over right kidney area Severe recurrently continued pain since injury Pyelograms show marked ptosis

Relief from ureteral dilatation temporary Pain relieved by lysis, sympathectomy, and nephropexy

Fig 6 M R, male aged thirty Urinary fistula of some duration followed pyelotomy and nephrolithotomy Retrograde pyelography shows definite blockage at ureteropelvic area. Plastic repair suggested, but nephrectomy done elsewhere reported as satisfactory

and renal sympathectomy combined with nephropexy have given brilliant results

There are other possible complications Urinary fistulas following conservative operation may necessitate nephrectomy In such a case cure is obtained only by the removal of all of the secreting renal tissue Calculus formation occasionally has a definite relationship to trauma, particularly when the nucleus of the stone is seen as a blood clot Indirect trauma to the kidney associated with extensive bony fractures may also lead to the formation of kidney stones Cysts, malignant growths, and tuberculous lesions have been occasionally ascribed to trauma Treatment for this group may be medical or operative, and the latter may be conservative or may call for nephrectomy

From the viewpoint of prognosis, the mortality of severe renal trauma has been estimated as between 15 and 20 per cent, with statistics slightly favoring operative treatment The mild cases—the great majority—clear in a few weeks, with results which are usually permanently satisfactory These cases, as well as the more severe ones, which have been treated expectantly or by conservative surgery, merit continued observation Certainly, urographic studies, particularly excretory pyelograms, should be made at intervals of time over a period of at least a year Retrograde

studies and kidney functional tests are of importance when there is any doubt as to the patient's condition It is only by following these cases in a proper and adequate manner that we can prevent or satisfactorily treat the numerous complications which develop as an aftermath of renal trauma From the industrial or medicolegal viewpoint, the status of the apparently healed ruptured kidney is important Wesson states that such kidneys are painless if they are in proper location and do not move with change of position, if the pelves are not distorted, and if the urine shows no pus, casts, nor organisms Such a kidney should have a good phthalein function and should show no evidence of defective drainage There should be no kidney pain unless there is an intrapelvic backpressure on the kidney

In those cases in which nephrectomy has been necessary, either at the time of trauma or following later complications, the results should not be unfavorable to a normal span of life, as the remaining unaffected kidney still maintains considerably more kidney function than is necessary for normal activity

In the past ten years we have encountered 43 cases of severe trauma of the kidney These we have divided into two groups—acute and late Of the former there were 18 cases Nine of these were nephrectomized as the result of the immedi-



Fig. 7



Fig. 8



Fig. 9

Fig. 7 J. B., male, aged twenty. Trauma from horse six years previously. No direct injury to left kidney area. Apparent recovery. Urological study as result of pyuria. Calculi, pyonephrosis; practically functional kidney. Total relief from nephrectomy.

Fig. 8 H. R., female, aged thirty. Indirect fall, several feet, with evident trauma to right kidney. Treated expectantly. Pyelographic study eight months later shows

pyonephrosis and ureteral kinking; functionless right kidney. Recovery following nephrectomy.

Fig. 9 W. W., female, aged forty-five. Reconstruct left pyelitis following horseback injury fifteen years before. Patient poseth all symptoms due from time of trauma. Pyelograms show constant structure deformity at left ureteropelvic junction. Plastic attempted, but adhesions and stricturing so dense that nephrectomy was resorted to.

ate injury and 9 of which 3 developed complications, were treated expectantly. Twenty-five patients in the so-called late group consulted us because of complications following previous renal injury. All of these gave definite history of trauma. Three of them were treated medically but 22 came to operation, conservative or radical, to the aftermath of renal trauma. In none of the 2 cases treated medically or of the 31 operated upon has there been any mortality.

Of the 9 cases in which nephrectomy was done for immediate renal trauma, 5 were personal and was seen in consultation, and the records of the remaining 3 have been loaned by medical friends for statistical study. The patients in these cases have ranged in age from eleven to fifty-five years. Two have been of the female and 7 of the male sex. Sudden sharp trauma of one form or another was the common etiological factor. Bony fractures occurred as a complication in 3. In all cases a satisfactory end-result was obtained (Figs. 2 and 3).

In the group of 25 patients who developed complications following previous renal trauma, there were 3 with definite hydronephrosis. In 2 of these nephrectomy was necessary. In the third a plastic repair has given a very satisfactory result (Fig. 3). Trauma has twice been the etiological factor in the production of perinephritic abscess

In both of the cases the end-result of drainage proved satisfactory (Fig. 4). Four patients with renal ptosis gave a history of trauma so definite that we could not question the etiology. Over a period of time extreme renal destruction developed in 2 and nephrectomy was necessary. In the other 2 satisfactory results followed nephropexy (Fig. 5).

Renal damage necessitating nephrectomy followed operative injuries of the ureter with a resultant fistula in 4 cases. Two were associated with hysterectomy. One followed reconstructive repair of the ureter after injury during hysterectomy and the fourth followed an unsuccessful ureteral transplantation. In all 4, relief was obtained by operation. (Several authors have recommended the placing of ureteral catheters preliminary to any operation in which the removal of the uterus is contemplated.)

In 5 cases surgical trauma led to later nephrectomy. In one calculi were removed from the kidney twice and in another three times before nephrectomy was resorted to. The third case developed cortical abscesses following nephrolithotomy. In the others persistent urinary fistulas followed operative removal of the renal stone (Fig. 6).

There were 6 cases of renal calculi following trauma. Multiple renal calculi followed multiple

fractures of the long bones in one case, and these were gradually passed with the aid of repeated cystoscopic maneuvers. In the other case initial trauma followed by continued infection and the formation of calculi led to such extensive renal destruction that nephrectomy was called for (Fig 7). Only 1 case of definite pyonephrosis in which the etiology could be convincingly traced to trauma has come to operation, and in this case nephrectomy was necessary (Fig 8).

There was 1 case of definite stricture of the ureter, in this case an attempted plastic repair could not be done, and therefore nephrectomy was performed (Fig 9). Extensive bilateral pyonephrosis and pyo-ureter developed in 2 cases following indirect trauma from fractures of the spine. Neurological changes were present in both. Treatment was expectant (Fig 10).

There was 1 case in which an operation for the removal of renal calculus was followed two years later by nephrectomy for a carcinoma of the kidney. This pathology was not present at the time of the first operation. We, ourselves, doubt whether the initial surgical trauma was responsible for the occurrence of the new growth, but we have especially listed this case to point out the fact that in all of the others of this series of 43 we were personally definitely convinced that trauma was the main causative factor for the injury and for the pathology found.

In addition, there were 9 cases in which the renal trauma was of such severity that operation was definitely contemplated, although conservative treatment was ultimately decided upon. All of the patients made an apparent recovery from the primary injury. Follow-up studies have been made on 7. One shows a definite ureteral stricture, the second, ureteral strictures and kinks, and the third, a beginning hydronephrosis. The remaining 4 show essentially negative intravenous pyelograms.

In conclusion, we have reviewed the literature of the past few years in an endeavor to bring out and to clarify what there is new in the clinical management of renal trauma. There is an increasing incidence of kidney injury as the result of automobile accidents. There appears, also, though this may be due to greater frankness on the part of reporting authors, a more frequent occurrence of trauma associated with pyelographic studies, cystoscopic instrumental maneuvers, and operative surgical work.

We encountered no new pathological contributions of importance. The condition has previously been well classified by different authors. The classical symptoms of hematuria, pain, hema-



Fig 10 J W, male, aged nineteen. Broken back. Complete initial retention followed by later overflow in continence. Marked pyuria, beginning cord bladder, confirmed cystometrically, pyonephrosis and pyo ureter on both sides. Treatment expectant.

toma, anuria, shock, and peritoneal reflex remain unchanged.

As to diagnosis, excretory urography, a development of the past few years, is of vital importance. Its use in the study of cases of renal trauma is becoming practically routine. In a percentage of cases, however, retrograde pyelography is of greater value. Interpretative studies by either method or by a combination of the two lead, first, to diagnosis of the presence of trauma and then to determination of its site and extent. Urographic studies are of immense value in the follow-up of cases treated medically and by conservative surgery, and they are of tremendous importance in depicting the different types of complications which frequently occur as an aftermath of renal trauma.

In treatment, while an analysis of our own cases does not particularly emphasize the fact, we find a growing tendency toward conservatism, both in the general management of the case and in the type of surgery used. New operative techniques, particularly adaptable to the conservative surgical treatment of trauma, are described. Indications for and against more radical types of surgery are evaluated. Numerous reports show that the use of the newer urinary antiseptics has reduced the incidence of, and helped in the treatment of both acute and chronic infections associated with renal trauma.

Prognosis deals with both mortality and morbidity. There is, seemingly, in later years, a less-

ening of the death rate due to renal trauma. On the other hand, we note an astonishingly large group of complications occurring as an aftermath of renal injury. Hydronephrosis, perinephritic abscess, chronic perirenal fibrous changes, nephroptosis, stone formation, urinary fistulas, and strictures and kinks of the ureter are mentioned. For these conditions the preferable treatment whether conservative or radical, has been analyzed, and we draw your attention to the fact that such treatment, late to be sure, is, nevertheless, a part of the picture of renal trauma.

We have presented and statistically analyzed 43 cases of severe trauma to the kidney. Twelve of these were treated medically, 9 were acute and 3 of the type illustrating the late effects of kidney injury. There were 31 operative cases, in 5 of which relief was obtained by conservative surgery. These were all of the type presenting late complications of renal trauma. Nephrectomy was necessary in 26 cases, in 9 because of the acute symptoms following immediate trauma, and in 17 of the late type because of a complication after math. In our total of 43 cases treated there was no mortality.

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GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

González, R *The Mechanism of Pyelovenous Reflux, Investigation and Results* (El mecanismo del reflujo pielo venoso investigación y resultados) *Bol y trab Soc de ciruj de Cordoba*, 1940, 1 10

The object of the experiments of González was to determine the mechanism of production of the reflux, the site at which the reflux takes place, and the pressure under which it occurs. He used healthy, adult rabbits, all of about the same age, which had not been submitted to previous experiments capable of altering the structure of the kidneys. The experiments were made on both kidneys. Each animal was killed and bled by section of the carotid artery, and the abdomen was opened to expose the ureters and kidneys. The renal veins and the ureters were isolated, the ureter being sectioned 4 or 5 cm from the renal pelvis, and a cannula was installed to be connected with a syringe and manometer, the renal vein was cut to allow free flow of the reflux fluid and thereby to avoid counterpressure. A solution of methylene blue was then injected until pyelovenous reflux occurred and the pressure needed for the purpose was noted, the solution of methylene blue was then replaced by one of Chinese ink, and the kidney was removed and fixed in 20 per cent formaldehyde for subsequent histological study. A colored gelatine solution was used instead of Chinese ink in some cases. The same technique was employed for human kidneys, but a colored gelatine or celluloid solution served for the injection.

Study of the preparations showed that the reflux does not always occur at the fornix, as claimed by some authors, but may take place in the wall of the calyx below the fornix, and that it does not consist of an infiltration of the connective tissue but of a passage of the injected substance through the wall of the calyx into the venous system, the arterial system does not participate in this process. It would seem that, in addition to the pressure capable of distending the walls of the renal pelvis, a special structural predisposition of the tissues of still unknown nature is needed to make the reflux possible. Taking into account the secretory pressure of the kidney, it has been found that average or even lower pressure was capable of producing the reflux, while higher pressure caused parenchymatous extravasation, especially in the upper pole of the kidney. Slow and continuous pressure for a period varying between ten and thirty seconds, under manometric control with the apparatus used by the author, produced the reflux without danger of extravasation.

Pyelovenous reflux is thus an established fact and may occur systematically under certain conditions. Those who have studied the question agree that it is a mechanism by which the kidney guards itself against atrophying pressure when the excretory tract

is blocked sufficiently to raise the intrapelvic pressure to a dangerous degree. From the clinical point of view, the pyelovenous reflux helps to explain the mechanism of hydronephrosis for which it has been necessary to accept some kind of resorption, as it has been impossible to demonstrate any tubular resorption of the pelvic contents, and there are anatomical and physiological reasons to deny it, the presence of an ampler route must be accepted to explain the pathogeny of the disorder. Then there is no doubt that pyelovenous reflux is the cause of certain incidents observed in pyelograms which have been accepted as extravasations of opaque substance because of excessive pressure during its injection.

The author has also observed the inverse phenomenon, venopyelic reflux. It cannot be obtained directly, but only after a pyelovenous reflux has first been established. It is on this basis that Hinman has given a physiopathological interpretation of the intermittent hemorrhages of hydronephrosis.

RICHARD KEMEL, M D

De Freitas, R *Conservative Surgery in Surgical and Medical Nephropathies* (A cirurgia conservadora nas nefropatias cirúrgicas e médicas) *Arq de cirurg clin e exper*, 1940, 4 113

In this comprehensive and profusely illustrated work, De Freitas discusses the radius of action of conservative surgery of the kidney in general and gives a list of its indications, pointing out that surgery invades the field of medical nephropathies in cases in which the lesions are progressive and irreversible by clinical treatment and lead to certain destruction of the organ by glomerular asphyxia, or in cases in which the symptom of hypertension is so alarming and refractory to the usual treatment that it can by itself cause grave or lethal accidents or lead to renal sclerosis. The author presents a short study of the various renal disorders placed on his list in order to justify his classification and to mention the adequate conservative surgical measures in each case.

He discusses nephroptosis, pyelorenal suppurating processes, including pyelitis, pyelonephritis, pyonephrosis, renal abscess, caruncle, and perinephritis, the pyelo-ureteral neuromuscular problem, its physiological and physiopathological aspects, and the neuromuscular disorder of the excretory tract, hydronephrosis, reno ureteral lithiasis, renal and pyelo-ureteral congenital and acquired anomalies, and medical nephropathies.

Nephropexy is indicated in nephroptosis, it may be direct (parenchymatous, capsular, or plastic) or indirect, but preference is given to the direct process by transfixion of the kidney with catgut sutures which are tied to the lumbar muscle (Papin's method without decapsulation). When decapsulation is indicated, as in chronic pyelonephritis and painful

syndrome the polar nephropexy of von Lichtenberg is used. I pyelic dilatations, corrective plastic interventions are indicated. When necessary adhesions due to chronic perinephro-ureteritis are liberated (nephro-ureterolysis). The treatment of renal lithiasis includes ureterolithotomy, pyelolithotomy, pyelolithotomy and nephrostomy according to cases. Nephrostomy is used in anuria with or without occlusion of the kidney. Nephrostomy has many indications. In infected hydronephrosis as a temporary or final measure or as a preparation for nephrectomy. In rebellious pyelonephritis and infected renal lithiasis. Decapsulation and denervation (surgical, chemical, periauricular, or total) serve as complements to other surgical interventions in pyelonephritis and lithiasis, or as curative or palliative treatment in medical diseases of the kidney: benign or malignant arterial hypertension, painful renal crises without substratum angioneurotic hematuria and secretory anuria. Suprarenalectomy (never bilateral) and section of the splanchnic nerves are also employed in arterial hypertension.

The lumbar route is used for all renal surgery through a large oblique incision. Lith resection of the lithiasis in the different planes are sutured individually and the patient is kept immobilized for a considerable time. Drainage of the renal pelvis is instituted only in pure infections or those associated with lithiasis and in hydronephrosis when nephrostomy is indicated. Drainage of the renal lodge is used in nephrectomy for tuberculosis or cancer and in laborious interventions on infected kidneys. The techniques for high derivation of the urine are usually operations imposed by necessity and their results are generally bad, but they allow prolonged survival in subjects with grave nephropathies. Segmental, peridural anesthesia (Dobhoff's method) gives satisfactory results. RICHARD KATZ, M.D.

Oberholzer, A. A Clinical and Experimental Contribution to the Study of Renal Hemorrhoids by the Interposition of Tissues (Contributo clinico sperimentale allo studio della emorragia renale per interposizione di tessuti). *Polid. Romae*, 1940, 47, sez. chir. 400.

The most difficult problem in nephrotomy and partial kidney resection is the control of hemorrhage. The blood pouring out of the gash has to be stopped carefully and definitely if much undesired secondary nephrectomy is to be avoided.

The best rejecting all other methods, emphasizes the interposition of tissues between the bleeding surfaces of the wound produced by operation. Various kinds of tissue have been recommended but Oberholzer does not approve of all of them. He especially prefers fresh muscle tissue as it is immediately available its chemical constitution gives the best guarantee of syneptic effect it is easily absorbed and it gives specific stimulus to the neighboring parts to fill in with new connective tissue.

Some authors however have warned that these insertions might inflict damage to the parenchyma

of the organ and that adjacent or even more extended parts of the cortex might be exposed to calcareous degeneration. Oberholzer has tried to solve the problem experimentally and clinically.

The author performed nephrotomy and partial resection in rabbits inserting strips of three between the bleeding surfaces of the cut (for the most part fresh muscle of the operated animal, otherwise preserved muscle or catgut threads). He used sutures of finest catgut to fix the inserted pieces and to close the gash. The results were satisfactory: bleeding having ceased promptly and completely. Secondary bleeding did not occur. After some time the inserted tissue was completely absorbed, and the final result was small scar or disfigurement of the kidney. Never have grave degenerative consequences been found, such as hydronephrosis, diffuse sclerosis or calcification. The incorporated strips never became encysted their total absorption took from thirty to fifty days. In a small zone on both sides of the cut, there was degeneration of the parenchyma and in few cases calcareous deposits were detected, but the degeneration did not tend to expand. Initial slight inflammation and vasodilatation in more distant parts soon receded.

The clinical observations of the author deal with patients operated upon by nephrotomy or partial resection, for the most part on account of calculi. Strips of fresh muscle are inserted to control hemorrhage and then the fibrous capsule was sutured together, in few cases sutures were drawn through perinephrymic parts, and the most vulnerable spots were protected from the catgut. (In small lumps of fat bleeding ceased almost immediately not later than on the third day after operation did the last traces of blood disappear from the drainage and the kidney healed postoperatively as well as or better than before the operation. Periodical roentgenographic examination showed the absence of calculi as well as of calcifications.

Thus the whole region of the kidney in question. Special methods such as urography, pyelography and the use of ureteral catheter proved that the function of the operated kidneys had not been disturbed. In one case death from bronchopneumonia occurred after twenty-one days. Histological examination showed no sign of calcification or progressing sclerosis.

Oberholzer comes to the conclusion that nephrotomy with the control of hemorrhage by means of inserted pieces of fresh muscle is a safe operation capable of keeping the kidney in good anatomical and functional condition. NELD CAMITO

BLADDER, URETHRA, AND PENIS

Lederman, M. Radical Treatment of Cancer of the Penis. *Brit J Radiol*, 1940, 13, 303.

The divergence of opinion in the treatment of cancer of the penis may be partly accounted for by the existence of certain locational and histological features of cancer of the penis which render complex

such problems as would normally present themselves for consideration in the treatment of skin cancer. These special features are as follows:

1 The majority of epitheliomas of the penis are infected, and histologically well differentiated and keratinizing in type, these factors tending toward radioresistance.

2 The skin and mucous membrane forming the fold of prepuce and covering the glans appear to be much more susceptible to damage by radiation than are such surfaces elsewhere. Furthermore, the skin of the groins appears to be unable to withstand reasonably heavy dosages of radiation, the normal warmth and moistness of these areas possibly accounting in some measure for this fact.

3 Lymph-node metastases are not uncommon and tend to be bilateral, the penis being a midline structure. These metastases respond poorly to radiotherapeutic treatment, since they are not only of a radioresistant type histologically, but are also often infected.

Until 1936 the treatment given to the primary disease at the Royal Cancer Hospital, London, was in the majority of cases by means of a molded applicator. The treatment was limited to the diseased area and a wide margin of surrounding healthy tissue. The filtration employed was 1 mm of platinum equivalent, the radium skin distance was 0.7 cm, and the dosage varied from 12 to 2 mcd per sq cm, as it depended on the type of lesion and the size of the area treated. When interstitial irradiation has been employed, and needles of varying lengths with a linear density of 0.66 mgm/cm and 0.5 of platinum filtration have been available, the duration of treatment was one hundred and sixty-eight hours and the amount of radium used depended on the size of the lesion.

With some exceptions the inguinal lymphatic regions have at all times been treated by 1 gm of telradium therapy following the principles laid down by the Radiumhemmet. Two 1 gm units (the details of which are given below) have been available, and doses varying from 14 to 28 gm hours per field and spread over a period of from three to six weeks have been given, the dose depending on general and local tolerance, the number of fields used, and the extent of the lymph-node involvement. In modern notation this would correspond to surface dosages of from 2,660 to 5,320 roentgens.

Present telradium technique has been consistent for the past three years, and its principles are:

1 To irradiate homogeneously the glans and major part of the shaft of the penis. A distance of 5 or 6 cm from the tip of the glans proximally has been considered an adequate length. In support of the value of irradiation of the shaft of the penis, Hutchinson mentions that, although a recurrence in a remote part of the shaft is unlikely, it is often difficult to estimate the extent of the local disease in the presence of sepsis and edema, and "when it is a question of assessing the utility of any technical procedure it is a wise precaution to ensure that the

unsuccessful case can never be due to failure to include every portion of the growth within the zone of lethal irradiation."

2 The lymphatic drainage areas are treated adequately, whether palpable nodes are present or not. The lymphnodal tissue present in the region of the saphenous opening is included in the treatment area.

3 A fractionated method of delivering dosage is employed, and the treatment to the primary lesion and the lymph-node areas is concurrent.

In the series of cases under discussion, radium therapy was in all instances the procedure employed in the treatment of the primary disease, although the technical methods of application varied. A brief résumé of the results obtained by these different methods is of interest.

The radium applicator was used in 14 cases. In 7 primary healing was obtained, and of the remaining 7, 2 were so advanced that the treatment had to be regarded as palliative, and 5 showed persistent residual ulceration or thickening after treatment. Seven partial amputations were performed, 2 for recurrence after primary healing, four years and one year after treatment (both sections positive), and 5 for residual ulceration or thickening within from five to ten months of treatment. In these 5 cases, 2 positive and 3 negative sections were obtained.

Telradium was used in 10 cases. Primary healing was obtained in all cases. With but 1 exception there were no local recurrences, and no surgical intervention was necessary. It must be pointed out that in the majority of these cases the time that has elapsed since treatment is less than three years, and an opportunity for recurrence is therefore still present.

Implantation was used in 4 cases. In 3 primary healing was obtained, but the remaining case was so advanced that treatment had to be considered palliative. In 2 of these 4 cases, however, it was found necessary to complete the full treatment with the radium applicator.

The inguinal lymph node areas were treated as follows: 21 cases by telradium (1 gm unit), 2 cases by bilateral block dissection, and 5 cases received no treatment at all. Of the 21 cases in the first group initial clinical freedom from metastasis was observed in 18 instances. Of these, 3 showed recurrences (2 bilaterally) after periods of four years, four months, twenty-one months, and fourteen months. Of these 3 patients with recurrence, 2 responded to further treatment (1 with telradium and 1 with x-ray therapy) and remained well.

Of the 2 patients treated by block dissection, 1 remained free from recurrence for seven months and died of intercurrent disease. The other has remained free from recurrence for eight years and nine months, but is now dying of adenocarcinoma of the rectum.

The 5 patients in whom the inguinal regions were not treated all remained free from metastasis. Two died of intercurrent disease six years and one month,

and thirteen months after the treatment of the penis. One patient is untraced after four years of observation, and the remaining patients are alive and well after five and one half years and three and one-half years, respectively
JOHN A. LOVY, M.D.

GENITAL ORGANS

Local, F. Hormone Treatment of Hypertrophy of the Prostate (Hormonoterapia del adenoma prostatico) *Rev. med. d. Rosario* 940, 20: 682.

After lengthy summary of what has hitherto been learned about the embryology, physiology and pathology of the prostate, Local reports the results of treatment with testosterone propionate of 3 patients with prostatic symptoms. In mild prostatism and incomplete retention without distention there was quick and outspoken improvement. In incomplete retention with distention the results were inconstant. The treatment proved ineffective in acute complete retention and sometimes in chronic complete retention. It improved the patient's general condition. Local recommends intensive continued treatment starting with massive doses. For prolonged treatment, the proper maintenance dose should be established.
HERNAN LARCA, M.D.

Thyssen, E. The Importance of Transurethral Resection of Cancer of the Prostatic Gland Performed According to McCarthy (Über die Bedeutung der transurethralen Resektion des Prostatacarcinoms nach Carthy) *Upsala f. Lager* 94: 173.

Of 200 patients in whom transurethral resection according to McCarthy was performed during the period from 1931 to 1933, 3 had a cancer of the prostatic gland. The author discusses the location, symptoms, diagnosis, and therapy of malignancy of the prostate and charts his results of operations.

Only in very few cases was cancer of the prostatic gland suspected on the basis of the subjective complaints, but in 6 instances the rectal examination justified the suspicion of malignancy and in all 6 the diagnosis was corroborated by the operative findings. All of the operations were performed under spinal anesthesia, as much tissue as possible was removed from all three prostatic lobes. The operation was followed by catheterization and irrigation of the bladder and in addition postoperative ray treatment was instituted, the fractional method being used. The total dose distributed over 6 areas was 3,000 roentgens; sometimes this, as reported.

A very frequent sequel of the operation for cancer of the prostatic gland is the inability of the patient to empty his bladder completely. This complication is usually absent after operations performed for hypertrophy of the prostatic gland. In 60 per cent residual urine was found, which averaged from 0.01 to 300 c.c.m.

Malignancy of the prostatic gland belongs to the group of slowly growing carcinomas which only

rarely form metastases. A checkup in 1933 disclosed that of 3 patients only 6 were still alive. In 1 case a recurrence of the malignancy or a urinary disease were given as the cause of death. A rule the patients were dead one year after the operation. Of 6 patients still alive April, 1933, 3 succumbed to recurrences before February, 1939. Of the 3 remaining patients 1 was suffering from very painful fistula of the urinary bladder and had numerous metastases in the osseous system. The second patient had to be operated on the second time like the third, as apparently cured.

According to the author's statistics the curative effect of transurethral resection of the prostatic gland for carcinoma is minimal. Therefore this method should be employed only if perineal prostatectomy cannot be performed.

(HARVEY) JOSEPH E. N. M.D.

MISCELLANEOUS

Rasmussen, C. H., and Stonebom, L. T. III. Sulfathiazole: A Clinical and In Vitro Study of Its Use in Infections of the Urinary Tract. *New England J. Med.* 94: 1445.

Sulfathiazole therapy for urinary-tract infections due to *Escherichia coli* and *Proteus vulgaris* has given encouraging results. In this clinical study it has been demonstrated that usually the urine not only becomes sterile and free of leucocytes, but also exhibits definite bacteriostatic and bactericidal action against twenty strains of *Escherichia coli*, three strains of *Proteus vulgaris* and ten strains of *Lophylococcus viridis*.

This bacteriostatic and bactericidal action of sulfathiazole is demonstrated in urine containing between 3 and 450 mgm. of free sulfathiazole per 100 c.c.m. A favorable response, as obtained in 3 patients with concentration of less than 30 mgm. per 100 c.c.m. It appears from these clinical studies and *in vitro* studies that concentration of between 30 and 300 mgm. per 100 c.c.m. of free sulfathiazole is sufficient to sterilize the urine. It is necessary to give from 1 to 4 gm. of sulfathiazole in divided doses daily to obtain such concentrations. Restriction of fluid not necessary. In severe infections, especially those associated with stasis of the urine, concentration of sulfathiazole between 300 and 450 mgm. is needed. From 1000 to 1500 mgm. of the drug may be placed in the urine by giving from 4 to 6 gm. in divided doses daily.

In severe toxic manifestations are encountered in these cases. Nausea and vomiting occurred in 3 cases and there were febrile reactions in 3, accompanied by cutaneous eruption. The bloods and urines were closely watched, but no evidence of toxic effects was noted.

It is interesting that complicating factors such as diabetes mellitus, prostatic obstruction, pyelonephritis and nausea and vomiting were present in the patients who were not promptly cured. Close analysis shows that some improvement took place under drug

therapy, and this treatment seems valuable even in these cases

In vitro studies on the action of the various sulfonamide compounds in concentrations of 10 mgm per 100 c cm, showed that sulfathiazole had the most marked bacteriostatic and bactericidal action. Several experiments with higher concentrations of the drugs showed sulfathiazole to be more effective, even at these concentrations

In conclusion, the authors state that sulfathiazole was used in the treatment of 25 cases of infection of the urinary tract, and it was shown to be effective against *escherichia coli*, *proteus vulgaris*, and *staphylococcus aureus* infections

The urine of patients receiving sulfathiazole exhibited marked bactericidal and bacteriostatic action *in vitro*. Comparative studies of the action of sulfathiazole, sulfamethylthiazole, sulfapyridine, and sulfanilamide in urine containing 10 mgm per 100 c cm, showed that sulfathiazole is the most effective bactericidal and bacteriostatic agent against *escherichia coli*, *aerobacter aerogenes*, *proteus vulgaris*, and *staphylococcus aureus* infections

JOHN A. LOEF, M D

Jensen, A T. On Concrements from the Urinary Tract. *Acta chirurg Scand*, 1940, 84 207

Eighty-four fresh concrements from the urinary tract have been examined by the x-ray powder method and in part by chemical and microscopical methods. It is shown that the powder method is superior to other methods when the unequivocal identification

of concrement substances is desired, and that the current somewhat vague terms for different concrement substances are amenable to exact definition by the aid of the powder method

The following substances were found in the surface layer of the concrements

(COO) ₂ Ca, 2H ₂ O frequently accompanied by colloidal apatite	40 cases
(COO) ₂ Ca, H ₂ O frequently accompanied by colloidal apatite	13 cases
MgNH ₄ PO ₄ , 6H ₂ O, colloidal apatite and mixtures of the two	23 cases
Uric acid	6 cases
CaHPO ₄ , 2H ₂ O	1 case
B Ca ₃ (PO ₄) ₂ and a trace of Ca-oxalate	1 case

Calcium oxalate monohydrate is found considerably less frequently in concrements than is calcium oxalate dihydrate. On the experimental evidence is based the claim that calcium oxalate is always deposited as dihydrate, monohydrate is a product of transformation. With this as a starting point the conditions for the formation of oxalate stones is discussed briefly. "Calcium phosphate" as a concrement substance means (apart from rare cases discussed in the paper) colloidal apatite in "alkaline" infection stones, in which it is accompanied by struvite (MgNH₄PO₄, 6H₂O), as well as in stones from sterile urine in which it accompanies calcium oxalate. Calcium carbonate in "alkaline" stones is not found as calcite or aragonite, but is probably adsorptively bound by colloidal apatite

JOHN A. LOEF, M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Odelberg, Johnson, G. T. *tuberculous Bone Foci* (Tuberkulose Knochenherde) *Verh Med Ges*, 1910, p. 284

Tuberculous bone lesions develop from the breaking down of older foci of the lung or lymph nodes by way of the blood stream and according to Wallgren and Lindblom especially during the first three years after the primary infection. A bacterial embolus reaches the artery of the marrow. A slight trauma, according to Krause favors the development of the focus. The damaged bone marrow is replaced by tuberculous granulation tissue. The bony trabeculae become necrotic through injury to the blood vessels or are destroyed by the granulation tissue and bony cavities filled with caseous pus and granulation tissue reformed. When larger endartery is obliterated a large area of bone necrosis will result and gradually become demarcated a large tuberculous sequestrum. The focus has a definite tendency toward demarcation.

The location of the focus in the skeleton may result in the following complications: (1) breaking through into joint with joint inflammation; (2) breaking down of important function of the skeletal part involved, especially in the spine; and (3) formation of abscesses and fistulae with threatened secondary infection. Tuberculous foci may arise in any part of the bony skeleton, especially in short spongy bone rich in blood vessels. In the foot, in which the os calcis is especially susceptible. Even in the patella isolated foci may develop in children as well as in adults. Complications of these foci are their breaking through into joint or fistula formation. The treatment consists in radical removal of the focus with retention of the wall of the cavity. In the pelvis there is frequent involvement of the acetabulum with danger of breaking through into the hip joint. Foci may develop in the pubis sacrum, in the ilium of the ribs tuberculous foci may develop near the transition of the cartilage in the posterior part—even in small children it is cystitis, spina ventosa simulating foci extending to the head of the rib.

The bodies of the vertebrae offer many foci of tuberculous. They are frequently involved multiply. Frequently the foci are found in adjacent bodies, on each side of the intervertebral disc—a focus. Frequent large necrotic cavities develop as is shown during autopsy. Clinical symptoms may not develop till the intervertebral disc is damaged or until body collapses and it carries. In the flat bones the little spongiosa the foci are rarer. In the skull fistulas may develop through the scalp by simultaneous involvement of both layers. In the lower jaw foci may lead to spontaneous fracture of

the malar bone and especially in little children result of small focal abscesses fistulas may develop which may lead to a typical retracted scar at the edge of the orbit. In the long bones the diaphysis and the metaphysis are involved especially during childhood (when the epiphyseal cartilage is involved growth may be interfered with). In the short diaphyses the metacarpal and metatarsal bones are most often involved. In the former the spina densa develops by periosteal proliferation. In older children and adults diaphyseal tuberculous is relatively rare. In general tuberculous skeletal foci may occur multiply and new foci may develop after long period of quiescence. As the tuberculous bone focus

only part of the primary tuberculous infection the prognosis depends on the latter. Acute miliary tuberculous frequently is the end result of such cases and congenital tuberculous frequent and serious complication. The tuberculous involvement of the lung is frequently under control by fibrosis. A serious complication in all tuberculous involvement of bone is the secondary infection and the formation of abscesses and fistulae with the danger of sepsis and amyloidosis. The treatment must primarily be directed toward the general infection.

Extensive operations should be avoided. Local treatment in the form of operation—in which the focus must be radically extirpated—should consist of the following: (1) primary and secondary operations, wounds and (2) the employment of orthopedic measures, long immobilization, and no weight bearing. Healing with some loss of function may be expected in many cases. It is mistake to attempt major operations and orthopedic maneuvers in the presence of poor general condition or in the presence of progression of the disease and it is likewise wrong to postpone clearly indicated procedure unnecessarily. The general condition of the patient should be improved first with dietetic and hygienic measures such as heliotherapy after which the general resistance increases and even bony foci may recede.

In the treatment of all cases of tuberculous bone disease the following three points must be observed (Erlacher): (1) the treatment of the tuberculous infection, the underlying disease; (2) the orthopedic indication, the preservation or the restitution of function of the involved bone; and (3) the economic indication—the cost and time required by the plan of treatment must be in proper relation to the achievable anatomical and functional result.

(RUBIN, LEO A. J. *JOINTS*, M.D.)

Am J L. C. M. Multiple Myeloma. Radiology 1910, 35: 607

The typical case of multiple myeloma presents fairly obvious picture but there are so many variations from the usual and lesions may be so close

simulated by other pathological conditions that diagnosis from clinical and laboratory methods may be obscure if not impossible

The lesions of multiple myeloma are malignant osteolytic tumors arising from cells in the red bone marrow. They have no relation to the osteogenetic cells and hence do not produce bone. By the time the lesions are sufficiently large to give x-ray findings, they are generally multiple in the involved bone and usually occur in several locations. The lesions in the early stage are, as a rule, limited to the bone and often there is no palpable tumor or swelling. Four definite types of myeloma are recognized by the Registry of the American College of Surgeons depending on the predominant type of marrow cell found in the lesion, namely, the plasma cell, myelocyte, erythroblast, and lymphocyte. However, this classification has no clinical significance. The gross pathology and the clinical course of these four types of the myeloma series are similar and cannot be differentiated except by microscopic study. The plasma-cell myeloma is the type generally found.

As the disease progresses the lesions in any one bone increase in size and number and there is usually an increase in the number of bones involved. There is no evidence that these lesions are metastases; they are probably independent lesions. However, myeloma does metastasize to the soft structures and typical lesions have been found in the liver, spleen, and lymph nodes. Occasionally metastatic glands are found before bone lesions are large enough to be demonstrable.

There are no characteristic symptoms of multiple myeloma. Pain may be mild until some minor injury precipitates a fracture or crushing of a vertebra, and it may be shifting and intermittent. It may be insignificant until after the bone lesions are well advanced, or it may be intense and severe before the lesions can be shown on the roentgenogram. The presenting symptoms may in no way point to the disease.

The presence of Bence Jones bodies in the urine occurs in from 50 to 65 per cent of myeloma cases but it is not pathognomonic. Bence-Jones bodies are formed in the bone marrow and may appear in the urine in any disease of the marrow including metastatic carcinoma. The presence of Bence-Jones bodies eliminates hyperthyroidism as proteinuria is not seen in this disease. The absence of Bence-Jones bodies is not significant because they occur only intermittently in the early stages of the disease and may be entirely absent in from 30 to 50 per cent of the cases. A more constant finding in the urine is the evidence of nephritis which occurs in about 70 per cent of the cases.

The blood picture is not characteristic, although there is usually a progressive anemia. There may be an increase in the serum calcium but the serum phosphorus remains normal or increased.

The roentgen findings depend on the stage of the disease in which the examination is made. Usually the patient appears several months after the onset

and there are diffuse multiple bone lesions. The bones most frequently involved are the spine, ribs, skull, and pelvis. The most characteristic findings are small, multiple, clean cut areas of bone destruction with the appearance of having been punched out of otherwise normal bone. The lesion is purely osteolytic and does not produce a bone reaction or sclerosis. While there is union of pathological fracture, there is no evidence of new bone on the roentgen films. There is no thickening of the tables of the skull and there are not the large areas of bone destruction which may be seen in the Schueller-Christian syndrome. There is no bone reaction in the surrounding skull as is seen in carcinoma and syphilis and the lesions do not tend to be irregular and infiltrating as in metastasis. In the spine, there may be extensive destruction of the vertebral bodies by osteolytic lesions presenting no x-ray evidence until the cortex is involved, with collapse of one or more bodies. In the ribs the most frequent finding is diffuse mottling and demineralization with multiple spontaneous fractures in areas of cystlike expansion. Lesions may perforate the ribs and give soft-structure tumors, spontaneous fractures of the ribs may cause localized subpleural hematoma and develop pleural effusion or empyema. Large soft structure tumors may arise from the posterior surface of the sternum or from the vertebrae, and give the appearance of primary mediastinal tumors. There is no metastasis to the lung fields, which factor is of importance in diagnosis.

The osteolytic type of metastatic carcinoma closely simulates multiple myeloma and it may be impossible to differentiate between the two on the roentgenogram. Bence-Jones protein may be found in either, and the blood picture may be identical in both. However, the typical small myeloma lesions occurring in the skull can usually be distinguished from the larger, more diffuse, moth-eaten areas of metastasis. The reactions of osteitis and sclerosis, frequently seen in and around metastatic lesions, are never seen in myeloma. Multiple myeloma lesions are purely osteolytic. Osteoblastic changes are evidence of metastases.

Paget's disease, in which the bone absorption is accompanied by simultaneous bone production and alteration and rearrangement of architecture, should not be a difficult differential problem. It is never a purely osteolytic lesion. The lesions of myeloma are never accompanied by the thickening of the tables of the skull which is characteristic of Paget's disease.

Four case histories are given which demonstrate the multiplicity and varied nature of the presenting symptoms and general course of the disease.

F. HAROLD DOWNTON, M.D.

Kaplan, E. B. Surgical Approach to the Proximal End of the Radius and Its Use in Fractures of the Head and Neck of the Radius. *J Bone & Joint Surg*, 1947, 23, 86.

Based on an anatomical study of the various branches of the radial nerve in the region of the el

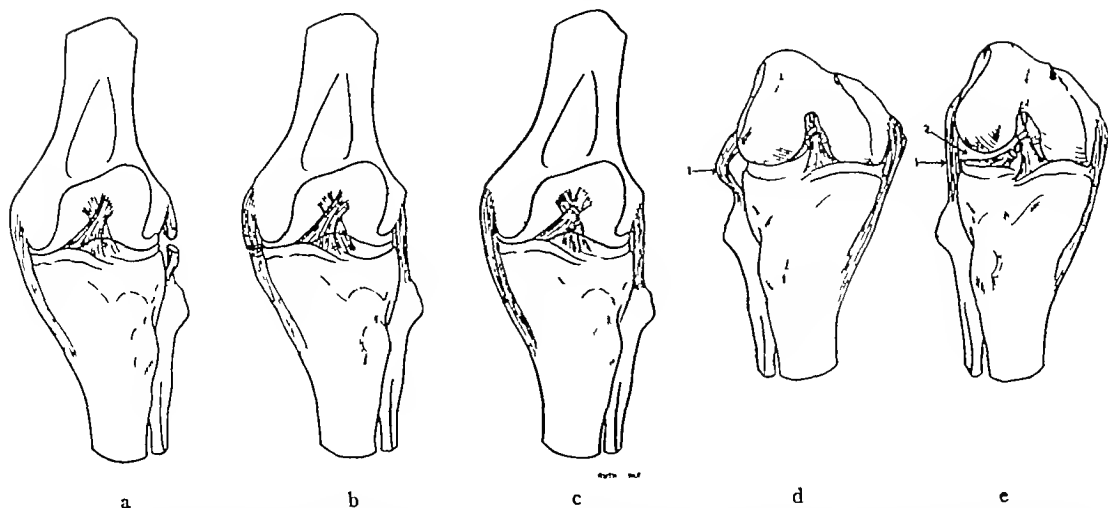


FIG 1 *a, b, c* A stripped joint in extension, various ligaments cut. *a* There is no abnormal lateral motion when only the fibular collateral ligament is cut. *b* There is no abnormal lateral motion when only the tibial collateral ligament is cut. *c* With the joint extended there is no abnormal lateral motion when both cruciate ligaments are cut and both collateral ligaments are intact (see *d* and *e*)

d, e A stripped joint in flexion with both cruciate ligaments cut and both collateral ligaments and menisci intact. *d* There is relaxation of the fibular collateral ligament (1). *e* There is an abnormal amount of lateral motion present (2). (Compare with Fig *c* where there is no relaxation of the fibular collateral ligament in extension and no abnormal lateral motion)

femur, and rotation will mean pronation or supination of the tibia on the femur

The following statements are generally accepted without controversy

Both collateral ligaments are taut in complete extension. The cruciate ligaments by twisting on themselves prevent abnormal medial rotation of the tibia on the femur. In the beginning of flexion the femoral condyles roll on the tibial condyles (certainly the lateral femoral condyle rolls on the lateral tibial condyle, but whether the medial femoral condyle rolls at all is under investigation), and after a certain degree of flexion the femoral condyles glide at one point on the tibial condyles. There is a small amount of lateral motion present in the normal knee joint. A certain amount of rotation is normally present in the flexed position. There is lateral rotation of the femur on the tibia during the first few degrees of flexion. The posterior aspect of the capsule and the oblique popliteal ligament aid in preventing hyperextension. The fibular collateral ligament is relaxed during flexion.

All opinions agree that muscular, tendinous, and fascial structures about the knee are important stabilizers and that they add great strength to the joint.

It is generally accepted that the tibial collateral ligament is intimately attached to the medial meniscus by fibrous tissue. From the study of the present series of joints, it seems evident that there is no strong fibrous tissue connecting these two structures. To verify this, further investigation is being carried on.

Motion of the menisci gives good evidence that the medial femoral condyle acts more easily as the axis of rotation of the knee joint. The backward or forward motion of the menisci is controlled by the movement of the femoral condyles. In moving from extension to flexion the lateral meniscus moves backward a considerable distance, which indicates the rolling backward of the lateral femoral condyle and which corresponds to the lateral rotation of the femur. The medial meniscus moves backward only very slightly.

It is evident from its attachments and position that the anterior cruciate ligament prevents forward gliding of the tibia on the femur, while backward gliding is prevented by the posterior cruciate ligament. However, in hyperextension both collateral ligaments are tight and, therefore, forcing the tibia and femur tightly together will reduce such motion to a minimum. In determining the effect of the tibial collateral ligament on this function, its attachment must be carefully considered. If it were firmly attached to the whole adjacent portion of the tibia, it would prevent forward and backward motion of the tibia on the medial side, but it is not so attached. Its posterior attachment, however, limits posterior gliding on the medial side while in complete extension, though its posterior portion is relaxed in flexion. The fibular collateral ligament cannot possibly exert any effect in flexion because it is relaxed. Clinically, anterior and posterior motion can always be demonstrated under the relaxation of anesthesia if either the anterior or posterior cruciate ligament is ruptured.

That some portion of the tibial collateral ligament is taut in all phases of extension and flexion is evident from the fact that abnormal rotation of the joint is prominent when this ligament is cut.

It is evident that both collateral ligaments, both cruciate ligaments, and the capsule are important in maintaining the lateral stability of the joint. Clinically, collateral ligament lacerations have associated cruciate ligament injuries and there may or may not be meniscal injuries. One has only to consider the well established fact that a normally functioning knee usually results when one or both menisci are removed at operation to realize the small part that the menisci play in lateral stability.

The most relaxed position of the joint capsule is from 5 to 30 degrees of flexion because all the joints assumed this position when distended by the injection of plaster. In order to have the joint in the extended position, it had to be held so until the plaster hardened.

In discussing the desirability of repairing the anterior cruciate ligament only or the tibial collateral ligament only when both are ruptured, it is probably safe to state that both should be repaired. In the knee joint there is very close interrelationship among the functions of the collateral and cruciate ligaments and the capsule. It is hardly possible to give one or more separate and definite functions to any one ligament. When the capsule is incised and sutured, it is intentionally or unintentionally tightened.

If either the tibial collateral ligament or the anterior cruciate ligament is repaired, when both are ruptured then there is restored to normal all but one of the five important stabilizing structures of the knee joint (disregarding muscular support). Therefore, the repair of either the tibial collateral or the anterior cruciate ligament gives satisfactorily functioning knee joint. The close interrelationship of the ligaments is the important factor in restoring stability and not the greater importance of one ligament over the other.

ROBERT F. MONTGOMERY, M.D.

FRACTURES AND DISLOCATIONS

Vázquez Rold, D. Recurring Dislocation of the Shoulder. Operation of Heymannovich. Nicola. Modification of his Technique (Luxación recidivante del hombro. Operación de Heymannovich. Nicola. Modificación de su técnica). Bol. Soc. de Ciruj. de Rosario, 1940, 7, 455.

The numerous surgical procedures recommended for the treatment of recurrent dislocation of the shoulder joint are indication of the lack of satisfactory methods in the treatment of this condition. In recent years Nicola introduced surgical treatment for this condition which is highly successful. The author's report is based on this procedure and its modifications.

First he describes the pathological anatomy of recurrent dislocation of the shoulder joint.

A Lesions of the capsule. Ligamentous and muscular structures.

Partial or total distention of the articular capsule.

3 Thickening, thinning, tearing, opening, and diverticula in the capsular covering.

3 Tearing of the capsule insertion at the glenoid.

4 Distention, distortion, elongation, and rupture of the muscles, especially the subscapularis and the large part of the biceps.

B Lesions which involve the osseous system of the joint.

Alterations in the articular surfaces, such as atrophy, hollowing, or widening of the glenoid cavity or alterations in its borders.

3 A bare smooth area on the posterior surface of the head of the humerus which is congenital in origin and frequently bilateral.

3 Deformity in the head of the humerus due to abnormal angulation with the diaphysis (about 90 degrees) (hatchet form humerus).

4 Alterations of the articular cartilage both of the humerus and the glenoid cavity (erosion, irregularities, and destruction).

A knowledge of the pathological anatomy is necessary for the choice of a proper therapeutic method. A common cause of recurring dislocations is improper care of the first occurrence of the dislocation by too early mobilization and massage which interfere with proper cicatrization and firm healing and consequently leaves an unstable joint. The reduced dislocation should be immobilized in plaster cast for at least fifteen days to allow for proper healing.

Surgical treatment of recurrent dislocations. The author reviews the literature on the various surgical treatments and classifies them as follows: (1) procedures to modify the articular capsule; (2) intervention on the articular skeleton; (3) work on the musculotendinous parts of the shoulder joint. The latter procedures include attempts to (1) fix the head of the humerus by fascia lata strips in bone tunnel, (2) fix the head of the humerus by strips of muscle tissue, and (3) fix the humerus by tendoplasty operations. The value of the latter is that living tendon structure acts as the fixing agent.

The significance of the biceps tendon is indicated by the report of Kohn on his found ruptured biceps tendon in 7 cases of recurring luxation of the shoulder joint. The author credits Heymannovich, Nicola, and Galuzzi in establishing the significance of the biceps tendon in curing this condition. The basis of their procedure is the fixing of the biceps tendon in a tunnel made in the epiphysis of the humerus. Heymannovich, in 1927, the first to use the biceps in this manner. Independently Nicola, in 1929, reported a similar method which by 1935 had resulted in 3 cures without recurrence. Nicola's technique is described in detail in his original article and Nicola's original drawings are reproduced. In brief the technique consists of severing the biceps tendon, making a tunnel in the head of the humerus.

and placing the biceps tendon in this artificially created tunnel, after which the biceps tendon is reunited by suturing, and the shoulder joint is immobilized in a Velpeau bandage for two weeks. Various modifications of this technique have been introduced by Hobart, Roberts, and Burnet.

The author had a series of 22 cases of recurrent luxation of the shoulder joint under observation. Seven of these were treated surgically. The first 2 were treated according to the method of Nicola. Then the author introduced his own modification which avoids severing and resuturing of the biceps tendon (a source of technical difficulty and weakness). He chisels out a tunnel from the upper part of the bicipital groove into the head of the humerus through the cortex down to the spongy bone, then the biceps tendon is placed down in this gutter and covered over with the spongy bone and a layer of the cortex which has been preserved for this purpose. The shoulder is immobilized for four weeks, after which function is gradually resumed with the aid of massage and motion. None of the patients has thus far had a recurrence. One of them plays basketball regularly and indulges in active sports, which at times require violent exertion. Experiments on animals indicate that a tendon so treated is soon encased in fibrous tissue which then becomes ossified so that the tendon is really encased in bone tissue at the end of the reconstructive changes which occur in the area of surgical intervention.

The author presents a series of illustrations which demonstrate his modification of the method of Nicola.

JACOB E. KLEIN, M.D.

Hoets, J. Fracture of the Neck of the Femur, Pros and Cons of Nailing. *Australian & New Zealand J. Surg.*, 1941, 10: 278.

Fractures of the femoral neck are now expected to be followed by good bony union in a large proportion of cases. With whatever means such a fracture is treated—Whitman's plaster, Smith-Petersen nail, or any other—the essential factor necessary for success is good reduction followed by adequate fixation until union occurs. Before any type of fixation is used, reduction must be accurate when shown by roentgenograms made in two planes.

The younger the patient, the more inclined is the author to use the Whitman method. The older the patient and the more debilitated, the greater is the need for nailing. When failure occurs with nailing, which happens in a small percentage of all the patients, the author uses osteotomy.

The author believes that the nail itself in the hip joint is not the cause of aseptic necrosis, arthritis, and non union. He presents 3 cases to prove his point.

NORMAN C. BULLOCK, M.D.

Schmid, P. Isolated Fracture of the Tibia (Der isolierte Schenkelbruch). *Arch. f. orthop. Chir.*, 1940, 40: 412.

In isolated fractures of the tibia the fibula may interfere with the reduction and immobilization of

the broken fragments, and therefore the question arises whether it is not advisable to fracture the fibula artificially in certain cases. Between 1926 and 1939, 177 patients with isolated fractures of the tibia were admitted to the Vienna Emergency Hospital. Thirty eight had compound fractures and were therefore excluded from the consideration. Others had another disease which exerted an unfavorable influence on the healing of the fracture. The author charted the remaining 96 cases in regard to the diagnosis, therapy, clinical course, duration of the healing process, and the ultimate result. He included in his material 10 cases in which an osteotomy or an osteoclas of the non-traumatized fibula had been performed. In not less than 36 per cent of the cases the age of the patients was under twenty years. The entire material is divided into 3 groups: torsion fractures, 55 cases; transverse fractures, 31 cases; and flexion fractures, 14 cases. The cases included both direct and indirect fractures. Severe dislocations were absent in the majority of the cases because of the obstacle formed by the fibula. Most of the displacements were corrected with Boehler's traction apparatus. The immobilization of isolated fractures of the tibia is rather difficult, a single reduction was sufficient only in 28 per cent, the reduction had to be repeated once in 22 per cent, twice in 10 per cent, 3 times in 5 per cent, and 5 times in 1 per cent. In the majority of cases in which the fibula was severed, the position of the broken tibial fragments was good. In 10 of the 86 cases in which the fibula remained intact malunion resulted. In 1 case delayed union followed. Pseudarthrosis did not occur.

The author concludes from his observations that a primary osteotomy or osteoclas of the fibula shortens the healing period of the fracture of the tibia because repeated applications of plaster-of-Paris casts become superfluous, and the isolated fracture of the tibia is transformed into a simple fracture of the lower leg which has good healing tendencies. In the majority of cases a prophylactic osteotomy or osteoclas of the fibula is not necessary because a consolidation of the fragments may be expected in from eight to nine weeks if traction followed by the application of a walking iron is employed. Roentgenograms should be taken at frequent intervals, at least once a week, and the displacement of the fragments noticed in the pictures should be corrected immediately. If after repeated attempts at reduction no good apposition of the fragments can be obtained or a delayed callus formation is noticed, the fibula should be severed.

(BODE) JOSEPH K. NARAT, M.D.

ORTHOPEDICS IN GENERAL

Kuperman, A. I. The Late Results of Gonorrheal Arthritis (Die spaeten Folgen der gonorrhoeischen Gelenkentzuendungen). *Urologiya*, 1939, 16: 84.

A report is given concerning the findings in 112 cases of gonorrheal arthritis, 76 of which presented

polyarthrititis. Sixty-nine and nine tenths per cent of the patients showed marked improvement in their condition, 3 per cent showed some improvement, and 7.9 per cent were discharged with marked distal rheumatism in the involved joints. About 54 per cent of these patients received ambulatory treatment for a period of about one month. It is possible to examine only 36 patients in person. 21 answered questionnaires. These 57 patients, therefore, formed the basis for this study.

Forty-four of them have had their joint conditions from four to eight years, 5 from a period of from 1 to 3 years. In 4 the gonorrhea had remained completely untreated up to the time of their admission. In 1 the gonorrheal involvement of the genital organs had remained untreated. A recrudescence of the joint condition coincidental with a gonorrheal reinfection occurred in 1 but was noticed in 5 others.

The therapy directed to the elimination of the remnants of gonorrheal infection consisted of baths in 3 patients, baths and injections of gonorrheal vaccine in 7, medical baths in 20 and diathermy and massage in 6. In all of the male patients with the exception of 1 in whom the disease as of recent origin the prostatic and seminal vesicles were examined. 1 of 29 on chlamydia from the normal were found, 5 showed prostatitis and 1 showed vesiculitis. The Bordet-Gengou test was made in 29 of the patients examined. This reaction was negative in 6 patients, positive in 8, early positive in 4, and uncertain in 1. The reaction as positive in all patients with prostatitis, vesiculitis, and dactylitis. It was negative in all cases of ankylosis. Of all the patients who presented themselves for follow-up examination (58.3 per cent) were completely cured and 7 (4.4 per cent) complained of pains and ring changes in either conditions. It should be noted that the latter group belonged to cases of reinfection.

Taken on the whole the results of this study reveal that the treatment of old gonorrheal arthritic conditions for the most part also favorable results.

(RALL) HARR A. SALERKAY, M.D.

Moore B. H. Some Orthopedic Relationships of Neurofibromatosis. *J Bone & Joint Surg* 94 3 99

The association of neurofibromatosis with skeletal changes that interest the orthopedic surgeon are classified under four headings: scoliosis, bone malformations of growth (usually hypertrophy) changes in bone structure and congenital pseudarthrosis in children.

Four cases of localized hypertrophy are presented. One of these involved only the third and fourth fingers of the right hand. The other cases also had hypertrophy of lower extremity and represented gradations in the degree of hypertrophy and involvement of the part.

A palpable tumor was present in the palm of the first patient. At operation the tumor was found to

arise from the median nerve and pathological examination showed it to be neurofibroma of the Ranke-neuroma type.

Elongation of the right leg with deformity and hypertrophy of the foot were present in the second patient. Skiing as noted beneath the internal malleolus and at operation this was found to be a tortuous, firm mass that was lying in close proximity to the posterior tibial nerve. Sections of this tumor showed it to be a neurofibroma with slight evidence of endarteritis.

The third patient showed increased leg length and hypertrophy and deformity of the foot. There was considerable roentgenological evidence of bony deformity in the foot. A tortuous, cordlike mass could be felt behind the external malleolus and a large portion of this was removed at operation. Pathological examination showed neurofibroma of mature type and also considerable endarteritis.

The left tibia of the fourth patient was 6 in. longer than the right. The foot was markedly deformed and disoriented. This patient also had marked scoliosis of the thoracic spine with edge-shaped vertebra at the apex of the curve, which showed normal epiphyses on only one side of the vertebral body. Amputation of the leg followed biopsy report of neurofibroma. The posterior tibial nerve in the amputated specimen was thicker than normal and on pathological examination showed rather plexiform tumor with tangled mass of mature fibrous tissue. Definite endarteritis was again present.

In addition to the cardinal signs of pigmentation and plexiform tumor these 4 proved cases of neurofibromatosis all presented one common feature, localized hypertrophy. There was in each case definite segmental relationship between the affected nerve and overgrowth. The rapid longitudinal growth of the affected long bones was evident by the preponderance of vertical trabeculae in these bones, but associated with such evidence of hypertrophy there was also underdevelopment and malformation of the bones in the foot, which is interpreted as representing uncontrolled bone growth.

Because of familial history of neurofibromatosis, 3 cases were selected from a series of 8 to show the relationship between pseudarthrosis and neurofibromatosis. The first case has been followed up for more than eleven years and although also of the middle tibial shaft (pseudarthrosis six) occurred eighteen months after an osteotomy. Zone of increased density in the lower third of the tibial shaft was the site of fracture six and one-half years after this operation and later resulted in second pseudarthrosis of the same bone. There was considerable skin pigmentation of this patient and definite familial history of von Recklinghausen disease given.

A pseudarthrosis in the lower third of both bones of the leg was present in the second case of this group. Repeated operations failed to produce union and amputation was necessary. Pathological

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

aminations of sections through the posterior tibial nerve showed an increase in fibrous tissue which in only a few nerve bundles had completely replaced the nerve tissue. The general structure was typical of neurofibroma.

The lower third of both bones of the leg was similarly the site of pseudarthrosis in the third patient. The one operation on this patient was unsuccessful and she was fitted with a brace to be worn until adolescence when another attempt to secure union is planned.

Pseudarthrosis and localized hypertrophy represent entirely different types of bone lesions, yet there are similarities. All but 1 of the pseudarthrosis patients and all of the patients with localized hypertrophy showed typical skin pigmentation. There was a similar segmental relationship between the involved nerve and the affected bones in the 1 case of pseudarthrosis that could be studied histologically. Growth of the affected bones in cases with

pseudarthrosis proceeds at the normal rate, but the bones show no inclination whatever to heal or produce callus.

The relationship between neurofibromatosis and bone growth and repair appears evident, but the mechanism is not entirely clear. There is, however, the indication that the bone changes studied in these cases are due to a lack of control over ordinary growth processes in bone. This may result in such diverse deformities as hypertrophy or overgrowth, hypotrophy or underdevelopment, distortions of growth, and changes in the constitution of bones as exemplified by their failure to unite after fracture. Furthermore, it is believed that these bone changes are the result of the nerve changes, but with nerve disease, bony deformity may not necessarily be present. Still unanswered is the explanation for the almost uniform evidence of endarteritis that was observed, and its relationship, if any, to the disease picture.

HOMER PHEASANT, M. D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Linton, R. R.: *Peripheral Arterial Embolism*. New England J Med 94 4 89.

The author notes that the successful restoration of the circulation in a limb following peripheral embolism depends chiefly on early and adequate treatment. The most common cause of gangrene following peripheral embolism is the failure to institute adequate treatment before the arteries distal to the embolus have been irreparably damaged. It is rarely the result of poor surgery or inadequate treatment.

Marked peripheral vasoconstriction of the arteries distal to the site of embolism uniformly occurs very soon after the lodgment of the embolus. In one case it was noted within an hour and half. The artery proximal to the embolus is not affected to the same degree. It maintains its normal caliber except for a very short zone of constriction adjacent to the embolus. The peripheral vasoconstriction plays an important rôle in the formation of the secondary distal thrombus which nearly always forms after the lodgment of the embolus, if early adequate treatment is not instituted.

This secondary thrombus develops as a result of the extreme degree of vasoconstriction and slowing of the blood stream distal to the site of embolism since the marked narrowing of the main and collateral arteries causes practically cessation of the arterial inflow to the extremity. This leads to stagnation of the blood in the involved arteries, which later clots to form the thrombus. Whether thrombosis begins at the most distal portion of the extremity and extends upward, or just distal to the embolus as a result of irritation to the intima has not been established.

A thrombus may form distal to an embolus as early as nine hours after the occurrence of the embolism. By then it may be so extensive as to prevent the return of the circulation to the extremity, even though the embolus and considerable portion of the thrombus are removed. Thrombus formation proximal to the embolus does not form so extensively as that distal to the embolus. Even after seventy hours in one case, it was only 3 cm long. It can readily be removed. The proximal thrombus is less likely to interfere with the collateral circulation than the distal thrombus, because usually it extends only up to but does not occlude the first major arterial branch proximal to the embolus.

The presence of distal thrombus virtually precludes the return of circulation to the extremity because it is impossible, even if the main artery is cleared of blood clot, to remove the thrombus from the smaller tributaries of the peripheral arteries. Failure in the treatment of peripheral embolism in most cases be directly attributed to the formation of secondary thrombus distal to the embolus.

In summary, the author states that restoration of the circulation following peripheral embolism can be brought about by means of early (within six hours) adequate treatment such as embolectomy or the use of intermittent venous congestion therapy and the interruption of the sympathetic path by novocain or local paravertebral lumbar injection. In conjunction with these forms of treatment, the intravenous use of heparin should prove of value in preventing the distal secondary arterial thrombosis.

HAROLD F. THURMOND, M.D.

BLOOD; TRANSFUSION

Domagala, E.: *On the Technique of Preserving Blood* (Zur Technik des Blutkonservierens). Zentralbl. f. Chir. 94, p. 131.

Five years of experience with blood storage and about 60 transfusions of preserved blood have led to the following "nearly perfect technique of preserving blood. Preservation of blood is successful only when certain factors which influence this preservation are given due consideration. These factors are the preserving substance, the storage temperature, strict asepsis, and protection of the stored blood against any harmful factors.

The following mixture has proved itself the best preservative: sodium citrate 1 gm., glucose 4 gm., sodium chloride 4 gm. and distilled water 100 ccm. This mixture has withstood the tests of trial, and is satisfactory for the conservation of 500 ccm. of blood, the amount which is usually drawn.

The author describes the technique of drawing blood as follows: Braun transfusion apparatus is used. As a container for the blood, a 500 ccm. narrow-necked flask is used. The fully filled flask is placed in a labeled pasteboard carton which is immediately placed upright in a refrigerator where it is protected against jarring. A 1 ccm. tube filled with the blood mixture is placed on the outside of the carton. This sample is used as control. Especial emphasis is given to three things in the drawing of blood:

- The use of paraffin in the lining of the inner surfaces of the syringe and flask.
- Filling the flask all into its neck without shaking the contents.
- The continual mixing of small amounts of blood with the preserving solution in order to prevent the formation of coagulum.

In storing the preserved blood, the mixture must be left absolutely undisturbed in the refrigerator at constant temperature of about 4 Centigrade. In determining the state of the blood two factors must be considered, infection and hemolysis. The less sharp the border between the serum and the packed cells, the greater is the hemolysis. Only marked hemolysis makes the blood unsatisfactory.

for transfusion, slight degrees of hemolysis can be disregarded. Since the adoption of this technique, practically no preserved blood has had to be discarded because of infection or hemolysis. The oldest blood used in a transfusion had been stored for six weeks. All other methods used by this writer have resulted in a loss of about 50 per cent of the stored blood. The blood could not be used.

The following is a description of the transfusion: the blood is warmed to not over body temperature after the flask is opened, care being taken not to shake the flask. The blood is forced into the recipient's vein by means of a pressure bulb, through a rubber tubing in which a fine sieve is placed and which leads directly to the vein. The drawing of the blood requires about ten minutes, the transfusion to the recipient requires from eight to ten minutes. Good results were observed in a large number of cases in which the blood was given by drip infusion (WELCKER) RULON W. RAWSON, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Leitner, S. J. Aspiration Biopsy as an Aid in the Diagnosis of Inflammatory Affections of the Lymph Nodes (*Die diagnostische Verwertbarkeit der Lymphdrüsenpunktion bei entzündlichen Lymphknotenaffektionen*) *Acta med Scand*, 1940, 105: 558

Leitner studied 21 patients with tuberculosis of the lymph nodes and 18 patients with acute or chronic non-tubercular lymph-node hyperplasia by means of aspiration, and in some of these cases found this method very helpful in making the diagnosis.

After local anesthesia with $\frac{1}{2}$ per cent procaine solution a fairly thick cannula is thrust into the lymph node. Then repeated aspirations are made with a 10 ccm syringe. When the aspiration is successful, a small piece of tissue with or without blood is found in the cannula. This tissue is spread on a slide. Leitner stains it according to the May-Gruenwald Giemsa technique.

A lymph node which is large enough to permit successful aspiration always is pathological. Thus, the author does not know how aspirated material from normal nodes would look. He assumes, however, that typical lymphocytes should dominate the picture. In addition, one finds younger cells from the lymphatic series, such as lymphoblasts, and plasma cells in all their stages.

Leitner summarizes his findings in aspirations of tuberculous lymph nodes as follows:

1 In acutely necrotic lymph-node tuberculosis one will find leucocytes, rarely lymphocytes, and later, epithelioid cells and necrotic tissue. Giant cells are found quite rarely in aspiration smears.

2 In chronic cheesy and calcifying lymph-node tuberculosis the aspiration smear is similar to that of the acute forms, however, there are more lymphocytes, and sometimes they are quite predominant.

3 In chronic, purely productive lymph-node hyperplasia one will find epithelioid cells and lymphocytes. In some cases monotonous lymphatic hyperplasia prevails. In these cases the diagnosis often cannot be made from the aspiration smear alone.

Aspiration biopsy of lymph nodes is of some importance in the diagnosis of Besnier-Boeck-Schaumann's disease (lymphogranulomatosis benigna—Schaumann and reticulo endotheliosis epithelioid-cellularis—Leitner). There is never any necrosis, and one finds a pure epithelioid cell hyperplasia. However, such a picture occasionally occurs also in productive lymph-node tuberculosis, therefore, biopsy by excision should be resorted to in such cases.

In Hodgkin's disease the aspiration biopsy gives very characteristic pictures, often more significant than an excision biopsy, and Leitner affirms the findings of other authors in citing from one case of his. One encounters in these patients a very polymorphous aspiration smear with lymphocytes, eosinophils, neutrophils, plasma cells, and Sternberg cells, in all stages of development.

The differentiation between tuberculous and pyogenous purulent inflammation of the lymph nodes, of course, is easy by means of aspiration smears. The prevailing type of white blood cell, and the morphological or cultural demonstration of the causative bacterium or bacteria establishes the diagnosis.

In glandular fever (Pfeiffer's disease) aspiration biopsy may contribute to the diagnosis, although Leitner's case had been diagnosed clinically and hematologically before aspiration. Leitner concludes, however, from his findings that this disease is of myeloid and lymphatic origin, as he believes that the plasma cells found in increased number in the lymph nodes were not carried there by the blood, but were autochthonous. HEINRICH LAMM, M.D.

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Ashausen, G. The Surgical Treatment of Gunshot Wounds of the Face and Maxillary Region (Die chirurgische Behandlung der Kriesschmerverletzungen im Gesichts-Kieferbereich). *Deutsche Zahn-zeitschrift* 940, 7 344.

Since the practical elimination of war-time epidemics, the chief function of the physician has become the treatment of wounds. In this regard the conservative attitude, which is of greatest value in the treatment of clean wounds, has given way to the operative treatment of contaminated wounds. While this change has been widely accepted in the field of general surgery it has not yet received widespread acceptance in surgery of the face and maxillary region. This fact is due, in part, to the failure of complete understanding of the principles of Friedrich, also perhaps to the fact that severe progressive infections of the face were seen less often because of the ample drainage. Nevertheless severe deformities often remain, if adequate treatment is not applied at the proper time. Thorough understanding and the proper application of Friedrich's principles may eliminate these deformities. The factors involved are the anatomical form of the wound, the extent of destruction of the wounded tissues, and the stages involved in wound healing. The authors likewise stress the importance of competent medical treatment in the production of good result in wound therapy.

Prevention of bacterial infection, control of that which is present and increase of the general resistance facilitates the healing of injuries. Wound débridement with the avoidance of unnecessary sutures is likewise an important consideration, particularly the avoidance of tight closures of the wound margins. Dental procedures, when necessary, should be secondary to adequate therapy of the wound itself.

In regard to skeletal injuries approximation with complete immobilization of the fragments suffices until adequate orthopedic treatment can be rendered at a later date when the soft tissue injury is no longer a pressing problem.

(J. VOLK) 5 ALLEN ROBINSON, M.D.

Dobson, L., Holman, E., and Corting, W. Sulfanilamide in Actinomycosis. *J. Am. Med. Ass.* 94 6 37.

Six previous reports in the literature on sulfanilamide in the treatment of actinomycosis were favorable. The authors added their 3 cases treated with sulfanilamide, in all of which recovery occurred.

In three was involvement of the jaw and the diagnosis of actinomycosis was made on the basis of smears, culture and tissue sections. Free drainage,

potassium iodide, roentgen irradiation, and general supportive therapy were without much benefit. The administration of 1 gm. of sulfanilamide every six hours was followed by marked regression of the lesion, and was stopped after the fifteenth day. There was a recurrence and the drug given again for twenty-one days with great improvement when it was stopped because of toxic dermatitis. Potassium iodide and roentgen therapy were reinstituted and the lesion healed.

In the second case there was actinomycosis of the right chest wall and right upper lobe of the lung. It positive smears. The administration of 6 gm. of sulfanilamide daily and of sodium iodide in doses up to 4 gm. with supplementary general upbuilding was begun. The smears became negative. The condition improved and the sinus stopped draining although there was little change in the lung fields. Five months later the lung shadows were reduced and the patient seemed well.

The third case was an extensive actinomycosis of the abdominal wall with cystitis (etiology?). The lesion remained stationary after about a month of treatment with sulfanilamide then regressed completely after the administration of more sulfanilamide and of iodides and roentgen irradiation.

On the basis of the last case the authors believe that the principal effect of the sulfanilamide during the early stages of treatment is on the secondary invaders and that other factors were important in the cure. However in view of the serious nature of actinomycosis, sulfanilamide is recommended for inclusion in the plan of treatment, though apparently not singularly effective. (LEWIS J. PERAZZ, M.D.)

Caldwell, G. A. Treatment of Gas Gangrene Experimentally Produced. *J. Bone & Joint Surg.* 34 3 8.

The author studied the effect on experimentally produced gas gangrene in guinea pigs following:

1. Local implantation of sulfanilamide crystals
2. Intraperitoneal injection of sulfanilamide
3. Implantation of zinc peroxide
4. Roentgen ray therapy

From these experiments he concludes that the best method is the use of zinc peroxide which prevents the development of gas gangrene in most instances. Local implantation of sulfanilamide seldom controls or prevents the development of gas gangrene. However the intraperitoneal injection of sulfanilamide after débridement and irrigation of the wound precludes the development of gas gangrene in high percentage of cases. Roentgen ray therapy has no effect upon fulminating infection but does bring some localization of the process when given once or two hours after inoculation, and when the animals survive forty-eight hours or longer.

D. WILLIE LEVINTHAL, M.D.

ANESTHESIA

Gillies, J. *Modern Anesthesia* Edinburgh M J, 1941, 48 26

The author reviews the changes that have taken place in the field of anesthesia between 1918 and 1940. These are discussed, for convenience, under the subdivisions of (a) inhalation anesthesia, (b) intravenous anesthesia, and (c) spinal analgesia.

INHALATION ANESTHESIA

Prior to and during the war from 1914 to 1918 chloroform and ether were the main anesthetic agents used. In the main, chloroform has been discarded in favor of ether because of the greater safety and lesser postanesthetic morbidity associated with the latter. However, the position of ether is now being threatened by newer agents less toxic still, such as ethylene, cyclopropane, and divinyl ether. Nevertheless, ether, used to supplement nitrous oxide and oxygen, in which sequence it appears to lose some of its objectionable features, will probably continue in use for some years to come.

Divinyl ether ($\text{CH}_2=\text{CH}_2\text{O}$) is supplied in liquid form and may be used by dropping it on a mask, by vaporization into the bag of an inhaler, or by drip control into any gas and oxygen machine. It allows rapid induction but is speedily eliminated, so that consciousness is regained almost at once after the administration ceases. It is less irritant to the respiratory mucosa than ethyl ether and produces a fair degree of muscular relaxation.

Ethylene (C_2H_4) is a hydrocarbon gas which has been used extensively in America, and while it has greater potency than nitrous oxide, it is not so effective an agent as cyclopropane, which has an anesthetic value nearly equal to that of ether.

Cyclopropane (C_3H_6), a hydrocarbon gas, acts in a two fold manner by displacing oxygen in the blood and by virtue of a degree of lipid solubility which it possesses. Because of its potency, cyclopropane is administered in a high concentration of oxygen, the average mixture being 15 per cent C_3H_6 with 85 per cent O_2 . This gas is practically non-irritating to the bronchial mucosa and therefore is easily respired by the patient. Recovery of consciousness is almost immediate because of the rapid elimination of the gas from the tissues—an important factor because patients have enough to do in recovering from a surgical intervention without the additional strain of having to eliminate a toxic anesthetic agent over a period of forty eight hours or more. Cyclopropane is expensive to buy, but reasonably cheap to administer. Cyclopropane, like ether, is inflammable and in certain proportions with oxygen is explosive, so that the usual precautions with regard to cauteries or diathermy apparatus must be taken. Finally, it may be stated confidently that this gas, administered in a closed circuit apparatus, is suitable for patients of any age, from the infant of a few weeks undergoing an operation for congenital pyloric stenosis to the septuagenarian undergoing

nailing of a fractured neck of the femur. Its greatest value has been best demonstrated in endothoracic operations such as lobectomy and cardio omotopy.

Acetylene, in a form called narcylen, has been used in Germany. Its stability is difficult to maintain, however, and it will never be a serious rival to cyclopropane.

Coincident with the search for and the exhibition of the aforementioned less toxic agents, the factor of premedication has assumed an important rôle and there is no doubt that good anesthesia with the agents described is dependent to some extent on the wise use of pre operative sedation. The fundamental purpose of premedication is to lower the metabolic rate and so render the patient more susceptible to the influence of the anesthetic agent.

However, a word of warning ought to be given regarding premedication. While efficient premedication is an excellent thing, the dosage must not be overdone. Such drugs in relatively high dosage exercise a toxic effect, and the patient may be no better off than if he had been given a toxic drug like chloroform. Additionally, by depression of the respiratory and vasomotor centers, excessive dosage of them may be a material factor in the causation of postoperative pulmonary complications.

Among the advances in the technique of general anesthesia there should be included blind intubation of the larynx, and the development of closed circuit anesthesia or the carbon dioxide absorption technique.

Although the apparatus appears somewhat complicated, the closed circuit technique is the simplest and most foolproof method devised for the administration of nitrous oxide and oxygen with or without supplementary agents such as ether or cyclopropane.

The simplicity of this method and its extreme safety are due to the fact that once the required depth of anesthesia is attained all the potentially dangerous elements (the gas and the ether) are cut out and only oxygen is supplied from the machine. Further advantages are that much less anesthetic is required for satisfactory anesthesia, that the circulating anesthetic vapor is warmer than the continuous cold stream of gas and ether of the semi open method, and that there is some conservation of water vapor which the patient would lose by exhalation if the circuit were not closed.

INTRAVENOUS ANESTHESIA

Pentothal sodium has been the most successful of such agents. Intravenous anesthesia requires expert judgment, and the occasional anesthetist ought to confine his use of the method to short procedures such as manipulations, reduction of fractures, and opening of abscesses, and then only when gas and oxygen is unavailable or unsuitable. Compared with other agents, this is an expensive anesthetic. Care must be taken not to administer this drug to patients who are undergoing treatment with sulfonamides.

SPINAL ANALGESIA

Hypobaric solutions such as procaine and procaine have had considerable vogue, but after considerable use of such agents one feels that there is less anxiety less risk to the patient, and considerable saving in time in the less elaborate method of dissolving procaine crystals (in the form of neocain for choice) in the patient cerebrospinal fluid and injecting the solution into the subarachnoid space. Very safe and satisfactory analgesia is thus obtained.

For upper abdominal work when spinal anesthesia is chosen, the detrimental effects due to intercostal paralysis can be effectively countered by the simultaneous administration of nitrous oxide and oxygen, or cyclopropane and oxygen sufficient to produce unconsciousness. Better ventilation of the lungs is thus maintained, and this combined method has much to recommend it.

When severe shock is present, spinal-block analgesia should not be used. It must be remembered that spinal block, while giving protection against the shock-producing sensory stimuli from the operation field, also produces paralysis of the sympathetic nerves in the segments involved, and this causes reduction in the volume of the circulating blood. In

severely shocked patient whose blood pressure is already low the additional fall may lead to a cerebral anemia of such degree as to depress the vital centers beyond the limits compatible with life.

Among the problems which confront the anesthetist is the one of choice of anesthetic and the method of administration for operations in certain regions and for certain surgical conditions. The author makes the following suggestions:

For operations about the head and neck endotracheal anesthesia is essential in order that the surgeon may have free access to the field of operation. In cases of severe head injury when the patient is unconscious no anesthetic is required, but it is a wise precaution to intubate the patient so that in the event that respiration ceases because of increasing intracranial tension, the anesthetist may immediately start rhythmic inflation of the lungs with oxygen.

For operations on the chest wall endotracheal anesthesia with remote control is the best method. Similarly for endothoracic work such as lobectomy or operations on the heart the endotracheal route should be chosen, but the added refinement of the closed circuit method with controllable intrapulmonary pressure is very desirable.

Abdominal operations require deeper anesthesia than all others. Spinal-block analgesia provides maximum muscular relaxation, and for routine operations in the abdomen this method is probably the best, if the patient is reasonably fit and properly prepared. Alternatively nitrous oxide and oxygen supplemented with ether may be given. In casualty

work, however, the abdominal cases will be chiefly patients who have sustained penetrating wounds. Such injuries, if viscera are perforated, usually pro-

duce a serious degree of shock, and for reasons readily stated, spinal block is inadvisable. Admittedly it is most unwise thing to employ spinal block when there is a question of the bowel being perforated, because of the unopposed action of parasympathetic nerves causing marked contraction of the bowel and expulsion of the content into the peritoneal cavity. Light non-toxic inhalational anesthesia with nitrous oxide and oxygen, supplemented if necessary by local infiltration or regional anesthesia, is the safest and most suitable choice.

Dislocations, fractures, and associated lacerations of the soft tissues of limbs are best treated as light general anesthesia, but it must be sufficient to allow the surgeon to overcome muscular contraction in his manipulations. Here again there may be marked shock, in which case nitrous oxide and oxygen should be used.

Finally mention ought to be made of anesthesia for patients suffering from burns. Such patients are generally seriously shocked and show diminished sensibility to pain. The only anesthesia required if it can be called anesthesia, is light gas and oxygen. Nothing more than that is necessary, anything more such as ether is extremely harmful to the patient.

SAMUEL H. KLEIN, M.D.

Rapaport, B. Anesthesia in Orthopedic Surgery. *Ann. & Anal.* 9: 20, 9.

Orthopedic surgery presents many problems which require individual solution on the part of the anesthetist. In most cases, less relaxation is required which allows the patient to be carried in the upright plane of anesthesia. Certain problems are entailed, however, which present difficulties both in the choice and method of administration of anesthetic. The use of the x-rays and other electrical apparatus makes the use of ethylene or cyclopropane hazardous, while many other circumstances render the employment of spinal anesthesia impractical.

Although the majority of orthopedic surgeons prefer inhalation to spinal anesthesia, yet if given in proper case, especially when inhalation anesthesia is either contraindicated or impractical, spinal anesthesia can be of great benefit.

The dosage required for spinal anesthesia in orthopedic surgery is much smaller and rarely need exceed 50 mgm. of procaine. 5 mgm. was found to be sufficient for foot operation, 75 mgm. for one of the knee or leg, and 100 mgm. for one of the hip pelvic bones. I cases in which the operation is long for longer period than procaine or neocain could allow pentothal or uperthane (500) proportionate doses may be substituted. I see cases of manipulation and stretching for sacroiliac conditions, as little as 50 mgm. has been given which resulted in complete relaxation for the required procedure.

For epidural anesthesia from 35 to 50 cc. of 1 per cent solution of procaine as introduced into the epidural space. Since this space has no direct

connection with the brain and spinal cord, it was hoped that frequent reactions associated with spinal anesthesia would be eliminated. Reactions, however, were found to be more severe and seemingly of the circulatory type from absorption of the drug into the circulation.

Local and regional anesthesia have a wide field of usefulness and a large number of minor operations as well as certain fractures and dislocations can be successfully handled under local anesthesia. Also caudal block for low back conditions and blocking of the sciatic nerve proves effective in many cases. Brachial plexus block is valuable for operation on the upper extremities. The latter does not, however, give a constant and uniform anesthesia even in the hands of the experienced.

Chloroform is not advised for inhalation anesthesia as it is believed that cyclopropane can take its place more effectively and with greater safety.

Ethyl chloride is still being used by many for induction in children and in minor surgery. It is considered a dangerous drug because of its likelihood of causing laryngeal spasm. The patients sometimes stop breathing after a very short induction and this may be followed by cardiac arrest.

Divinyl ether (vinethene), given by the drop method, can be employed only in short operations. It has a degenerative effect on the liver and is only suited to short operations in which a quick and smooth induction with good relaxation is desired.

Ethylene can be more effectively replaced by cyclopropane. Since both are equally inflammable and explosive, there is nothing to be gained from the use of the former when cyclopropane is available.

Nitrous oxide, having a potency of only 25 per cent as compared with the other two anesthetics, is more often employed for short and minor operations. Anything more extensive requires either a basic anesthesia such as avertin, or supplementary anesthesia of ether or cyclopropane. Since it is not explosive, it can be used with either the x rays, cautery, or other electrical apparatus.

Ether is the anesthetic which is the easiest and safest to administer. With 100 per cent potency, it is a valuable supplement to all other weaker anesthetics and basic anesthesia agents. The toxicity of ether is much reduced when it is used in combination with other drugs. When administered alone, in large amounts, and for a long period of time, it has a marked irritant, depressive, and toxic effect upon the respiratory and gastro intestinal tracts. It also causes liver and kidney damage. The most important contraindications are disturbances and pathological conditions within the respiratory organs.

Cyclopropane, a very effective and potent anesthetic with practically no toxic effect upon the blood chemistry or vital organs, has only one drawback in that it is inflammable and explosive. It is especially indicated in conditions in which ether is to be avoided, and is particularly recommended in cases in which the patient needs a high percentage of oxygen, as in anemia, sepsis, diabetes, general

debility, and in chest, liver, kidney, and glandular conditions. Its smooth and quick induction, with its accompaniment of complete relaxation, renders it of great value for short orthopedic procedures which require good relaxation. It is also good in major orthopedic operations with or without basic anesthesia.

The two agents most commonly used for intravenous anesthesia are evipal sodium and pentothal sodium. Both are barbiturates and their action is equally rapid. Since they are non-volatile substances, they are destroyed in the body. This process takes place so quickly that there is no question of cumulative effects. This type of anesthesia is most suitable for short operations lasting from ten to twenty minutes. The contraindications are cardiovascular and renal diseases, respiratory obstruction, and liver trouble.

Avertin is the most popular agent with orthopedic surgeons for rectal anesthesia. Its employment as a basal anesthetic in doses of from 60 to 80 mgm. per kilogram of body weight greatly facilitates the induction by elimination of laryngeal spasm. The maintenance is smoother and relaxation is obtained with much less of the anesthetic agent and a larger percentage of oxygen. Since it has no deleterious effect on the heart, it is very beneficial in reduced doses on cardiac patients. Since it is eliminated through the liver and kidneys, it should not be given in diseases of these organs. It should not be employed in operations upon the colon or rectum and in diseases of the lower bowel on account of its irritant effect on open mucous membranes. It should also be avoided in long standing septic conditions and in overwhelming infections, in diabetes, anemia, and marked arteriosclerosis, in debilitated and aged people, and in infants. The two extremes of age do not require basic anesthesia on account of the low metabolic rate of infants and old people, which renders them less resistant to an anesthetic agent, and of which they, therefore, require a less amount.

Evipal sodium used in a 10 per cent solution with a dosage of 0.2 cc. per pound of body weight may be administered rectally with a fine catheter. Its only advantage over avertin is that there is a smaller amount of solution injected into the rectum, the amount being one seventh that of avertin, and it is therefore recommended when there is danger of the solution's being expelled.

The intravenous administration of glucose and saline solution is advised in case of marked bleeding or trauma, it should be done during the operation. Transfusion is to be resorted to when indicated.

In cases in which movement of the chest is greatly impeded by the patient's having to lie on his face, such as in spine fusion operations, Leech's pharyngeal airway is recommended. This airway consists of a bulbous projection made of rubber at the end of an airway tube and so shaped as to fit snugly into the cavity of the pharynx. This gives a clear airway and a closed system for rebreathing without the requirement of keeping a mask over the face.

A statistical report of the types of anesthesia employed at the New York Hospital for Joint Diseases during the year 1938 is also given.

F HAROLD DOWLING, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Morres Barros, N. A Comparative Study of Silk and Catgut as Materials for Suture and Ligation (Estado comparativo entre seda e catgut como materiais de ligadura e sutura) *Rev. de chir. de S. Paulo* 34, 6 3

The question of suture material seemed to be settled with the discovery of catgut. Surgeons were so delighted with the fact that it was absorbed that they failed to study its other qualities carefully and paid little attention to those surgeons who still preferred silk including Kocher in Germany. Habsted in the United States, and Godin in Brazil.

However in recent years careful statistics have been collected on the two suture materials which show that when properly used in aseptic cases silk has certain decided advantages over catgut. The author cites statistics from the literature not for the purpose of discrediting catgut but to justify a greater use of silk.

In every clonization there are two phases: exudative and proliferative. Experiments on rats in which the stomachs were sutured, some with silk and some with catgut showed that the exudative

phase was prolonged in the cases in which catgut was used and that the establishment of a resistant scar required a longer time than when silk was used. This initial quality of catgut is largely due to the chemical preservatives used, such as iodine, formalin, and chromic acid.

However the allergy produced by catgut is more serious than the chemical irritation. Catgut is a foreign protein taken from the intestines of sheep, the most contaminated part of an animal that has a strong tendency to produce allergic reactions in man. Figures are given from various sources in regard to the allergic reactions produced by catgut.

Figures are also given showing a greater percentage of dehiscence of wounds when catgut was used than when silk was used, but various factors enter into the causation of dehiscence.

Tests of different makes of catgut are reported and there was found to be considerable difference in the percentage of infections following the use of catgut prepared by different manufacturers. Higher percentages of infection are reported with catgut sutures than with silk.

Silk should not be used in infected wounds if it can be avoided. However if fine silk is used and a careful technique as possible is employed, with the avoidance of trauma, silk sutures are not yet to be eliminated. The author believes that silk is the suture material of choice in all non-infected wounds.

ARTHUR G. MORGAN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Gilardoni, A. Roentgenography in a Millionth of a Second (La radiografia al milionesimo di secondo) *Radiol med*, 1940, 27 944

A few years ago, the author designed an apparatus for "ultra short" roentgenographic exposures. A high tension generator charges a condenser and between this condenser and an x-ray tube is inserted a "spinterometer." As soon as the tension in the condenser grows high enough to overcome the explosive distance of the spinterometer, the condenser instantly discharges all of its stored energy on the x-ray tube. The result is an extremely short flash of x rays, repeating itself automatically in given intervals. The initial tension and the capacity of the condenser are directly proportional, and the current emitted by the tube is indirectly proportional, to the duration of the single flash. With an initial discharge tension of 100 kv, this apparatus produces more than twice the energy generally used by a modern street car, with flashes as short as one millionth of a second.

The Philips Company of Lindhoven, Netherlands, has recently built a similar apparatus, allowing exposure times of one millionth of a second by overheating the cathodic spiral of the tube and by employing a condenser of very small capacity.

Gilardoni, however, insists that for medical purposes his apparatus is sufficient and that the new one made by Philips is impractical. The necessity of ultrashort exposures occurs in the roentgenography of moving objects, which otherwise would cause blurs on the picture. However, the speed of human movements generally does not exceed 50 mm per second, as in the case of a tachycardiac heart, it may be higher in children and in arteriography, it may rise to 100 mm per second during spasmodic fits. Using the "milligraphy" of Gilardoni, even in such cases the blurrings would amount to only .05 cm, which is practically nil. In the "regmography" (Cignolini) of the lungs these "unavoidable blur-

rings," according to Gilardoni, would be kept within normal limits.

On the other hand, the minor capacity of the condenser always means a reduction of the x-ray energy left for roentgenography, and, therefore, a shorter distance between object and film. Gilardoni obtained pictures of the duodenum from a distance of 70 cm and of the normal lungs from 150 cm. The Philips Company mentions that the only picture of a human being was that of a hand, taken "from a very short distance." Perhaps the further development of the Philips apparatus will make it suitable for certain cases of regmography.

NELDA CASSUTO

Hemmingson, H. Roentgenological Investigations on the Intracranial Subdural Space with a View to Revealing the Presence of Subdural Adhesions. *Acta radiol*, 1940, 21 379

A brief account of the topography of the intracranial subdural space is given, and the origin and significance of subdural adhesions between the brain and the dura in cases of post-traumatic encephalopathy and epilepsy is discussed. Encephalographic procedures have demonstrated occasional air accumulations either wholly or partially in the subdural space after lumbar or cisternal insufflation and various explanations offered for its occurrence by different investigators are given consideration. The presence of subdural air on the encephalogram is not a sign of cerebral atrophy, which is a misinterpretation sometimes found in the literature.

Penfield and Norcross have advanced a method for direct intracranial subdural insufflation which is described in detail. With it, this cavity has been brought within the range of roentgenography, and it is possible to reveal subdural adhesions directly on the roentgenogram. The author has used this method in a number of examinations and presents his findings in normal and pathological cases. A report of 4 cases is appended in which subdural adhesions were visualized in this manner, but the encephalograms gave no definite signs of the presence



Fig 1



Fig 2



Fig 3

Figures 1 to 3. Filamentous subdural adhesions over the right frontal lobe in Figure 1 and a broad, superficial ad-

hesion over the right frontoparietal region in Figures 2 and 3

of cerebrodural cicatrices and in all of the cases no adhesions could be found through the trephine hole during the Penfield operations. Numerous roentgenograms illustrating the findings are included.

ABRAHAM HARRISON, M.D.

Kirklin, B. R. Bleeding Lesions of the Gastro-Intestinal Tract and Their Roentgenological Diagnosis. *Am J Roentgenol* 94 45 7

Among the many and varied manifestations of disease Kirklin wrote few are more definitely indicative of potentially grave organic changes than bleeding from an internal organ, and the concern with which it is regarded, both by the patient and his physician, is fully warranted. When frank bleeding from the alimentary canal has occurred and the clinician has ascertained that the hemorrhage is not of orbital origin, he will try to determine its probable source from the history, physical signs, results of clinical tests, and the subtle and indefinable insights that he has learned from experience. Often, by his own methods alone, a capable clinician can appraise the general situation and nature of the lesion with admirable accuracy. However, even in such instances no one realizes more keenly than the clinician himself that his diagnosis is not complete without roentgenological examination to confirm his opinion as to the nature of the lesion and to determine its exact site and size and the presence or absence of complicating factors.

In cases of hemorrhage from the canal the first thought usually is of peptic ulcer. This inference, although it should not be held to the exclusion of others, is logical, for peptic ulcer is known to be a common source of bleeding. Of the two principal varieties of peptic ulcer the gastric variety is encountered much less often. The fundamental roentgenological sign of gastric ulcer is, of course, the barium-filled crater the niche. In profile the niche appears usually as a smooth hemispherical prominence from 0.5 to 2.5 cm. in diameter projecting beyond the line of the gastric lumen. In the face view, under thin coating of barium on the mucosa or after compression of the barium content of the stomach, the niche is manifested as a dense spot in the hazy shadow of the mucosal relief. Benign ulcer is characterized by non-elevation of its margin, accentuation and convergence of the rugae toward the crater, tenderness of the niche to pressure, and gastroparesis as manifested in curving of the lesser curvature and other distortions of the stomach.

Among bleeding lesions in the upper portion of the canal, duodenal ulcer stands first in frequency of incidence.

Next to peptic ulcer cancer in some part of the digestive tract, especially the stomach, should be considered a possible source of hemorrhage because cancer is relatively common and its early diagnosis is of the highest importance. Ulcerating mucosal cancer with its deep thrust into the gastric lumen, can hardly escape recognition with the roentgen rays. Infiltrating scirrhous cancer

tends to encircle the stomach and produce a neck-like deformity and the multiple shallow ulcers on its internal surface when coated with barium, have the appearance of ground glass. Small ulcerating cancers have often been mistaken for simple ulcers but are characterized by a tattered border which, under pressure, throws out the opaque medium appears as a transradial halo around the dense barium-filled crater. Small to be considered in connection with gastric cancer are the malignant ulcers, which have no tattered border but are likely to betray their malignancy by the irregularity of their craters and the absence of tenderness and spastic manifestation, or distortion of neighboring rugae.

Esophageal varices usually are secondary to cirrhosis of the liver. Profuse hematemeses often results from rupture of the distended vessels. Later, after the lower portion of the esophagus is affected, and the veins are greatly dilated and nodular. With the roentgen ray the varices are depicted as bulbous shadow defects intruding into the lumen with deep crevices between. The picture strongly resembles that produced by polypoid new growths but these rarely occur in the esophagus.

Benign intragastric neoplasms comprise myomas, fibromas, adenomas, and mixed varieties of tumors. They seldom attain great size, may be single or multiple, and benigne in number tend to become pedunculated. Ulceration is common but usually superficial. Therefore bleeding is likely to be slight and occult but more or less continuous and sufficient to produce anemia which is often the principal or sole clinical sign. With the roentgen ray the individual new growths appear as regularly rounded or ovoid transradial spots on the barium shadow and the general form of the stomach is not altered. Numerous multiple closely packed polypoid adenomas have a characteristic resemblance both macroscopically and roentgenologically to convolutions of the brain. Especially to be remembered is the fact that apparently benign tumors of the stomach are often partly malignant.

Although not common ulcerative gastritis cannot be omitted from consideration. The ulcerations,

which are exceedingly numerous and small, can occasionally be discerned in the face view but in the tangential view they are clearly exhibited. Fine sharp closely set, uniform serrations on the border of the barium shadow and the picture pathognomonic.

Duodenitis, diffuse inflammation of the duodenal mucosa, with or without local shallow erosions, is met with rather frequently. It may occur in association with frank duodenal ulcer or independently and in source of hemorrhage that may be severe. Roentgenologically it is marked by irritability and rapidly changing outflows of the bulb and by coarsely and irregularly reticulate mucosal pattern, due probably to puckering of the mucosa by spasm of its muscularis.

Cancer of the duodenum is extremely rare and when the growth is situated near the bulb the roent-

genologist is likely to attribute the deformity to duodenal ulcer. Cancer in the lower segments of the duodenum, however, produces a shadow defect like that caused by cancer of the stomach or large bowel, and at least the neoplastic nature of the lesion should be apparent.

Scurrhous and mucoid cancers in the colon produce the same roentgenological manifestations as in the stomach and rarely escape diagnosis. Tuberculous enteritis, with its tendency to affect predominantly the terminal ileal coil and proximal portion of the colon, is usually distinguishable from the resulting asymmetrical and irregular narrowing of the intestinal lumen together with obliteration of the mucosal markings and hyperirritability of the bowel. Likewise, ulcerative colitis can be identified confidently from the fact that the disease obviously has progressed proximally from the rectum and from the diffuse narrowing and shortening of the lumen, often with local constrictions producing the appearance of a string of sausages. Benign new growths in the colon, like those in the stomach, are usually small, single, or multiple, sometimes numerous, and commonly pedunculated.

Lust, F. J. Roentgenological Studies of the Mucosa of the Normal Terminal Ileum. *Am. J. Roentgenol.*, 1941, 45, 63.

The normal terminal ileum has not yet been very widely studied roentgenologically. Its mucosal pattern may be demonstrated by administering barium orally or by enemas or covering autopsy specimens with a thin layer of contrast substance. With the oral method, examinations made from three to eight hours after ingestion of the barium invariably yield satisfactory observations. After the barium enema only those cases permitting flow through the ileocecal valve can be observed. Spot film exposures with compression provide good views of the desired loop without overlapping. Studies made revealed parallel and mostly longitudinal mucosal folds of clearcut contour about the thickness of straw. The contrast substance is visible in the crevices of the mucosa, whereas the folds stand out clearly without being covered by barium. The folds converge toward the ileocecal junction.

Further studies of the terminal ileum dealt with the type of filling of this loop. This occurs slowly, the contrast substance slowly trickling along the crevices of the gut. The folds have a wavy appearance and present creeping movements. The waves are shallow and usually occur only on one curvature at a time. Later the bulk of the barium is continuously transported through the ileum into the cecum. The ileal contractions occur ringlike in two places simultaneously, from 2 to 5 cm apart. These contraction rings should not be confused with mucosal folds, they are much broader than the folds and appear in both curvatures simultaneously. It is emphasized that the careful study of the individual folds is just as important as that of the whole mucosal pattern.

ADOLPH HARTUNG, M.D.

Pendergrass, E. P., and Hodes, P. J. Roentgen Irradiation in the Treatment of Inflammations. *Am. J. Roentgenol.*, 1941, 45, 74.

This communication is an attempt to analyze the results obtained by roentgen irradiation in 527 patients treated for infections in the Department of Radiology of the Hospital of the University of Pennsylvania. It includes cases of bursitis, carbuncle, cellulitis, draining ears, erysipelas, erysipeloid, furuncle, gas gangrene, granuloma telangiecticum, herpes simplex, parotitis, pneumonia, sinusitis, and verruca vulgaris. As an introduction, various opinions relative to the mechanisms by which irradiation influences inflammation are discussed under the following headings: (a) effect upon bacteria, (b) effect upon normal cellular response to tissue irritants, (c) effect upon normal immunological responses, and (d) effect upon the vascular system. Technique is also given consideration in a general way to indicate the varying factors used.

Each of the conditions treated is discussed in detail and the results obtained by others as well as by the authors are tabulated. The dosages used, number of treatments given and the time interval between them, location and size of areas exposed, other therapeutic measures used simultaneously, and co-incidental factors which have a bearing on the therapy are given lengthy consideration. Experimental data in connection with some of the conditions are also included.

In conclusion the authors stress the importance of considering roentgen therapy but one step in the treatment of inflammations. Nature's inherent protective mechanisms are probably of more importance and must be maintained by adequate supportive measures if the best interests of the patient are to be served.

ADOLPH HARTUNG, M.D.

Wintz, H. Roentgen Irradiation of Inflammatory Processes and Its Action Mechanism (Die Roentgenbestrahlung entzündlicher Prozesse und ihr Wirkungsmechanismus). *Strahlentherapie*, 1940, 68, 3.

Wintz discusses the nature of roentgen irradiation of inflammatory processes and the reasons for its action. He thinks that this action is not a direct effect of the irradiation because, first of all, inflammatory foci located outside of the irradiated field are also favorably influenced, second, the roentgen rays have no direct bactericidal action, third, exact dosage is not necessary to obtain results, and fourth, typical humoral changes, which correspond to those observed in shock, occur after the irradiation.

For instance, after roentgen and radium irradiations, it is easy to demonstrate the immediate occurrence of acidosis followed by alkalosis of the blood, leucopenia, retardation of the coagulation time, decrease in the blood pressure, decrease in the colloid stability, hypoglycemia, and hypervagotony. Wintz gives the following explanation for these symptoms.

The irradiation first causes a disturbance in the equilibrium of the blood colloids, which in turn leads

1. conglobation and destruction of the leucocytes with released protein substances then produces the remaining symptoms of shock. The shock causes an increase in the defense powers of the body and this explains the favorable action produced by the roentgen rays.

The author rejects the usual dosage of from 15 to 20 per cent of the skin erythema dose for inflammations and recommends 80 per cent for abscesses of the sweat glands, 40 per cent for mastitis, and 34 per cent for chronic inflammation of the adnexa.

(T. AVTOROV) RICHARD KIRBY, M.D.

Pickham, A. Practical Results of Researches on the Irradiation Effect on Genes as Applied to Roentgen Therapy and Roentgen Diagnosis. *Radiology* 94 36 43

After briefly reviewing the mutation effects produced by different short wave radiations as determined experimentally by various research workers on drosophila the author presents the following conclusions:

1. In therapy the use of higher doses than those determined experimentally is permissible only in cases in which the possibility of later pregnancy is not to be considered that is to say if the patients have passed the menopause or in case of some disease in the treatment of which fertilization as end-result is of little consequence.

2. In ray examination of the region of the sex organs—for example, in fluoroscopy and in roentgenography of the female pelvic organs (in pregnancy and in salpingography)—great attention should be paid to the number of roentgens delivered by these procedures. Attention should be further paid to the fact that in radiogenetics the $L = K$ (intensity time equals constant) law is valid, also in contrast to physiological reaction the time factor is without effect, so that repeated small doses, independent of the time in which they are given, lead to cumulation.

ANDREW HARRISON, M.D.

Salgado, C., and Ferolla, J. The Question of Injury of the Embryo Caused by X Rays (A questão do dano germinativo provocado pelos raios X) (*Rev. bras. de ginec.* 940, 3 39)

The question of whether the ovum or embryo is injured by irradiation of the ovaries with roentgen rays is one of great practical interest and one in regard to which there has been great deal of discussion.

The literature on the question of irradiation of the female and its effect on the progeny is reviewed. Special stress is laid on the work of M. Elker on drosophila melanogaster. He irradiated the ova and spermatozoa of these flies and found that mutations resulted in the offspring. By mutation, however, he meant not so much somatic change in the offspring as change in the germ plasma of such nature that alterations are brought about in future generations. The importance of this work in human treatment is admitted.

If it was proved that such irradiation did damage the offspring the temporary sterilization of women by means of roentgen rays could not be justifiable. There are many roentgenologists and gynecologists.

be feel sure of this and prefer not to use the method. There are others, however, who still believe that there is no reason to avoid it so when it is indicated.

The authors on the basis of their own experiments on rats, belong to the latter group and think the method is justifiable. They irradiated 5 adult female Wistar rats, using 180 kV, 4 ma, a filter of 3 mm of copper, a focal distance of 30 cm., and fields measuring 6 by 8 cm. The greater part of the bodies of the rats as covered with lead plates, only the region of the ovaries being left exposed. The animals were given doses of from 4 to 60 roentgens. The dose for temporary castration of the rat is from 50 to 60 roentgens; that for the ova is about 200 roentgens.

These rats are bred to the fifth generation and 8 descendants are produced, and in none of the latter were any changes found which were due to roentgen irradiation. The authors think this argues in favor of the harmlessness of the method. However, they do not wish to express dogmatic opinions on the subject, but merely to record the results of their experiments. ARTHUR G. MONTAG, M.D.

RADIUM

Joint Radiology Committee of the Medical Research Council and the British Empire Cancer Campaign. Medical Uses of Radium. Part I. *Radiol.* 94 4

This summary report on the medical uses of radium has been prepared by the Joint Radiology Committee of the Medical Research Council and the British Empire Cancer Campaign.

Among the many investigations few attract special attention because they not only have scientific value but offer therapeutic hints.

Gloeckmann has made detailed quantitative histological analysis of the reaction of squamous-cell and basal-cell carcinoma in man to carefully measured doses of gamma or ray radiation. The results showed that the sequence of events is similar to that observed in irradiated normal tissues. Irradiation is followed by fall in the number of mitotic cells because of a delayed entry of cells into division. Cells attempting division later on break down as described previously for normal irradiated tissues. Inhibition of division is followed by increase in cell size and by keratinization in some squamous-cell carcinomas. The large cells finally disintegrate while attempting division, and keratinizing cells lose their reproductive powers and disappear as cornified material.

Using chick fibroblast cultures hanging drop preparations, Lavinaki, D. D. E. Lea have compared the effectiveness per roentgen of radium gamma rays and of three regions of the x-ray spec-

trum, the effective wave lengths being 0.014, 0.017, 0.150, and 0.363 Å. It was found that the three x-ray wave lengths were, within the accuracy of the experiments, equally effective, but that the gamma rays were less effective by a factor of about 2. There appears to be a real difference in the efficiency, per ionization in tissue, of different wave lengths of radiation.

J. C. Mottram and L. H. Gray report that during the year an investigation has been made upon the relative response of the skin of mice to x-radiation and gamma radiation. Short lengths of the tails of mice were irradiated with x and gamma rays, so that the dose received was the same at all points throughout the irradiated portion of the tail for each irradiation. When thus irradiated with equal doses the skin reactions were found to be markedly different. The ratio of effectiveness for erythema and desquamation was 1.3, and for epilation and exudation 1.6, the x-irradiation having the greater effect.

JOSEPH K. NARAT, M.D.

Quimby, E. H. The Specification of Dosage in Radium Therapy. *Am. J. Roentgenol.*, 1941, 45, 1

This is the Janeway Lecture of 1940, delivered before the annual meeting of the American Radium Society, on which occasion the author was presented by Zoe Z. Johnston, in behalf of the Society, with a bronze medal, as a reward for "scientific accomplishments of the utmost importance."

The lecture represents an analytical review of the salient facts which have been evolved during the past two decades in the development of useful methods for the specification of radium doses, and to which the author has contributed in no small measure. At the same time, definite suggestions are made, in the hope that, with the aid of the Standardization Committee of the American Radium Society, they may lead to the establishment of a uniform system of practical radium dosimetry.

From the earliest days, the radium dose was stated in terms of the amount of radio active material employed and the duration of the irradiation, which in fact is the "emitted" dose. The quantity of radiation arriving at the cells to be affected, or the "delivered" dose, may be considerably less, and the actually effective, or "absorbed" dose, may constitute an even smaller quantity. Because of these difficulties with direct physical measurements, various biological dosage methods were devised, most common among them being the observation of the erythema reaction produced in human skin. It must be noted, however, that any such biological dose can be established only as a "standard," and cannot be used as a "measure" of the amount of radiation administered.

In general, there are two aspects of the dosage problem, which depend on whether the radium (or radon) sources are external or interstitial, although sometimes the two may overlap.

The accurate measurement of the dose of external irradiation from radium applicators of many shapes

and sizes and at various distances is exceedingly difficult. A more desirable procedure is to calculate the relative intensities by relating, for example, the doses delivered by all applicators to the dose from a point source, and then to test experimentally a few of the results so obtained. If, now, the number of milligram, or millicurie hours required to produce a certain skin erythema with any one of the listed applicators is known, that for any other can be determined by interpolation. The tables worked out at the Memorial Hospital, New York, contain data for some 200 practical applicator sizes and distances. More recently, Sievert, Mayneord, and Patterson, and Parker have published calculations employing more precise mathematical methods but covering smaller ranges of practical applicators.

In interstitial irradiation, both the size of the sources and the distances to be considered become very much smaller, so that the measurement with the minutest ionization chambers available becomes even less accurate than in the external irradiation. However, here too, good use can be made of the comparison of relative intensities. Failla and his coworkers in a long series of experiments actually determined the values of such intensities by making use of three different methods, such as determining the relation of milligram, or millicurie, hours exposure to the radius of necrotic tissue produced around the implanted source in the muscles of rabbits, the relation of the amount of radiation to the radius of bleaching around a similarly imbedded source in butter, and, finally, the relation of a bees-wax surrounded radiation source to the intensity of human skin erythema. On the other hand, intensity curves were calculated in a manner similar to that employed for external sources by Sievert, Paterson, and Parker, Laurence, and the author herself, due allowance being made for the tissue-absorption factor. From such curves, experimental or theoretical, it is possible to determine the relative doses for various given practical situations, if the implant is a seed or very small needle and is assumed to behave essentially as a point source. If multiple implants are used, it appears best from the point of view of simplification of the calculations to determine the minimum lethal dose that can be delivered to any particular point of the diseased region and to plot the dosage curves accordingly.

During the last few years attempts have been made to express the radium dose, both for external and interstitial application, in the absolute roentgen unit. The author, after carefully analyzing the various physical factors which influence the accurate realization of this unit for the gamma rays of radium (in contra distinction to the roentgen rays), states that if such a dosage scheme is to be adopted, three things must be taken into consideration. First, any value for the roentgen equivalent of the milligram hour must be regarded as subject to correction although this probably amounts to not more than a few per cent. Second, this value is correct only for points in the tissue surrounded by at least 4 mm. of

localize. The neurologist frequently believes that in these patients there is no organic trouble in the nervous system and sends them to the psychiatrist.

The author cites the case of a thirty-year-old woman whose general health was good but who complained of continuous, sometimes exacerbating pain in the right upper limb. This followed severe alveolar caries which she believed to be due to infected teeth, requiring denervation. It was not possible to obtain from the patient a description of the character of the pain in the right upper extremity. This pain was so troublesome that it eventually led her into melancholic depressive state. Physical examination revealed no abnormalities.

The author states that pains similar to that of the patient cited have been considered to be of vascular or sympathetic origin. Sympathetic pains are associated either with an organic lesion or with modification in the size of the limb and circulatory and thermic changes. In the author's case there seemed to be no organic lesion of the sympathetic centers and pathways. The objective difficulties, since they could not be related to purely mechanical causes, seemed to justify the supposition that the sympathetic system was involved. However, this interpretation must be reserved, since there are anatomical changes. The author believes that the sympathetic system might have been responsible for the condition but this probably is not great.

Cyclothymic (manic-depressive) states are characterized not only by alterations in personality and character but also by modification in functions or organs. In many patients who are less deeply affected emotionally vascular symptoms are evident. Sensitive symptoms including headache, tender spine, epigastric pain, and vague and diffuse arthritis are predominant in many cases. Exaggerated anesthesia is constantly noted. In many patients the symptoms are localized in different organs with each attack. The plastic forms of cyclothymic states in which the patient retains confidence in his physician's pain can be alleviated by drugs and by reassurance from the physician.

MICHAEL DEBAKEY, M.D.

Dahlberg, G. On the Heredity of Malignant Tumors. *Uppsala Litterat. Ark.* 1925, 46.

The development of tumors may be compared to vegetative reproduction. In certain low-grade multicellular animals reproduction sometimes occurs in the following way:

Soon after cell in the animal returns to primary embryonic stage. A cell or group of cells begins to divide with enormous rapidity. From among the descendants a new individual is differentiated. Vegetative reproduction occurs above all in adult individuals. Each adult has special tendency to occur after certain number of cell generations and this involves lapse of time. At present we can hardly decide whether in particular trees on the number of cell segments trees or on the time which has lapsed.

If we look at the tumor problem against the background of vegetative reproduction we can recognize striking analogies and see possibilities of explaining the most important features of tumor tissue. In both cases we are dealing with formation of autonomous character. To certain extent they grow as parasites on the mother animal. To certain extent the cells of both share embryonic characteristics, but in the non-malignant tumors this is not so marked, and the tendency to growth is less strong. The tendency of the tumors to occur especially in older individuals is also analogous to phenomena of the vegetative reproduction, as is the fact that tumors may develop spontaneously. However, it should be emphasized that if we interpret the formation of tumors by analogy with vegetative reproduction, must not carry the analogy too far. It is evident that tumor formation is not merely reproductive process. The author would merely imply that chemical and physical changes involved in tumor formation resemble chemical and physical changes involved in vegetative reproduction, in so far as they occur under similar conditions. It implies nothing about the nature of these changes.

It is a known fact that environmental agencies and stimuli in particular may bring about the development of malignant growths. If an environmental agent is not the cause of the development of tumors, the cause must be sought among hereditary factors. A third possibility exists. The suggestion advanced implies three things: (a) rudimentary tendency to and vegetative reproduction is inherited by every individual of the species, (b) practically every person who lives long enough ought to develop malignant tumor. Some people develop cancer after comparatively few cell divisions at a younger age others develop the disease only after much more numerous cell divisions and at more advanced age, (c) third group may develop malignant tumors only if exposed to very strong irritation, which itself provokes cleavage of cells.

If this is so the prospect of proving that malignant tumors are hereditarily determined could be greater if select individuals who have died of tumor is younger than if those only persons who have died of cancer or sarcoma in old age. From this point of view, person who has died of cancer at the age of ninety years must have comparatively weak tendency to form tumors. Hence should not expect his relatives to show significantly higher frequency of cancer than other people.

To test this hypothesis the author collected data pertaining to this subject from the files of three insurance companies. The first step was to sort out group of persons who have themselves died of cancer but were offspring of parents who had not died of cancer. For the sake of simplicity this group is called the normal group. The remaining part of the material embraces persons who have died of cancer and are offspring of parents on both of whom had also died of cancer. This group is called the cancer group.

TABLE I—DEATHS FROM CANCER

	Num ber	Aver age	Error of mean
<i>Series A</i> Persons having died of cancer but whose parents have <i>not</i> died of cancer	1 837	54.6	0.30
Persons having died of cancer and whose parents have <i>also</i> died of cancer	104	55.93	1.00
Persons whose parents have died of can- cer below the age of 60	58	51.83	1.20
Persons whose parents have died of can- cer above the age of 60	46	59.07	1.50
<i>Series B</i> Persons having died of cancer but whose parents have <i>not</i> died of cancer	176	57.54	0.85
Persons having died of cancer and whose parents have <i>also</i> died of cancer	169	55.51	0.93
Persons whose parents have died of can- cer below the age of 60	96	53.28	1.24
Persons whose parents have died of can- cer above the age of 60	73	55.95	1.12
<i>Series A and B</i> Persons having died of cancer but whose parents have <i>not</i> died of cancer	2 013	54.57	0.20
Persons having died of cancer and whose parents have <i>also</i> died of cancer	273	55.33	0.60
Persons whose parents have died of can- cer below the age of 60	154	52.73	0.91
Persons whose parents have died of can- cer above the age of 60	119	57.06	0.94

If we first compare the normal group with the cancer group, the differences are not statistically significant. In series A (embracing material collected by the author), the normal group happens to show a lower death age. In series B (embracing the material collected by the Association of Directors), the normal group shows a higher death age. In adding the figures of both series, the normal group shows a somewhat lower age of death than the total cancer group. The fact that the materials agree within the limits of error suggests that there is a real difference because there is a source of error which tends to lower the value of the normal group below that of the cancer group. If we examine the cancer group after dividing it with respect to parental death age, in the material as a whole we find a difference between the two groups amounting to 4.33 ± 1.30 . This difference is more than three times the standard error and is therefore significant.

The author's method of investigation of the hereditary factors, although costly and time consuming deserves attention but has to be tested on a larger material to allow a definite conclusion.

JOSEPH K. NARAT, M.D.

Des Ligneris, M. J. A. Precancer and Carcinogenesis. *Am J Cancer*, 1940, 40, 1.

The question whether or not there must always be a precancerous stage, recognizable as such by histological or clinical examination, is not merely academic, it is of paramount practical importance.

The possibility of early treatment is naturally bound up with that of early diagnosis. If it can be shown that cancer is always preceded by a precancerous condition, and if this latter condition can be diagnosed as such, then the question of early cancer diagnosis naturally becomes a question of diagnosing precancerous conditions, at the same time the general prognosis must be enormously improved. If, on the other hand, it is shown that only a comparatively small number of cancers are preceded by a precancerous condition, that in the majority of instances such a condition cannot be diagnosed, and that of the diagnosable cases only a very small proportion lead eventually to cancer, the term precancer loses its importance and the chances of treatment suffer accordingly.

The author describes four groups of experiments as follows:

1 The development of sarcomas and allied tumors in rats and mice treated with cancer-producing chemicals.

2 The production of benign and malignant skin tumors in mice.

3 The development in stages of fowl sarcomas after the injection of tumor filtrates.

4 The development of spontaneous mammary carcinoma in mice of a tumor-susceptible strain.

In rats and mice treated with carcinogenic chemicals (3,4-benzpyrene and methylcholanthrene) the development of intraperitoneal and subcutaneous sarcomas follows a fairly long preparatory, precancerous period. Different types of tumors are produced according to the tissue on which the carcinogens act. Many of the tumors thus obtained are transmissible to other animals of the same strain for a limited number of generations.

The production of skin tumors in mice with these same cancer producing hydrocarbons is always preceded by a precancerous state, papillomatosis. When, as a consequence of the application of the cancer producing chemical, the cell has reached a certain stage of constitutional alteration (though this stage may not necessarily be accompanied by microscopically recognizable changes), cancerization may proceed without the aid of further specific carcinogenic action. Non-specific irritation (scalding) has at this stage the same effect as the specific action by a cancer-producing compound. On the other hand, such specific stimulation cannot be replaced, in early stages, by non specific stimulation (scalding). No increase in the rate or frequency of cancerization is obtained by the simultaneous application of a specific and a non specific stimulant.

When a filtrate of a Rous tumor is injected intramuscularly, subcutaneously, or intracutaneously into a new fowl, local tumors appear, which have the same appearance whatever the site of injection. The cells from which the tumor develops are the blood and tissue macrophages and fibroblasts of undifferentiated type. The Rous sarcoma is thus a malignant tumor of the reticulo endothelial system. The transformation of a normal cell into a tumor cell

under these conditions occurs suddenly there being a precancerous state.

The author also describes the development of spontaneous mammary carcinoma in mice. A definite precancerous state could be found in the cancer-susceptible strain of mice. The tumors developed in the mammary gland were either of the adenocarcinoma or of the carcinoma simplex type. In some tumors the cells were very small and the tumor resembled a sarcoma or lymphosarcoma, but even in these cases some portions of the tumor contained rudimentary alveoli and thus showed the transition from the more differentiated adenocarcinoma to the more anaplastic small-cell carcinoma simplex. In no tumor was there an considerable amount of connective tissue. Several tumors were partly cystic.

The main results of investigations reported in the literature dealing with the relationship between mammary cancers and other tumors, on the one hand, and hormones, more especially sex hormones, on the other hand, are summarized as follows:

The susceptibility of certain mice to the development of mammary cancer is due in the first instance to a hereditary character of the cells involved. According to whether these take up large or small quantities of the hormone (estrogen) which forms their natural stimulant, breast cancer will develop more or less frequently, there being no difference in this respect between males and females. In normal mice males fail to have breast cancer simply because of the absence of estrogen, not because the male breast cells are less liable to become cancerous than the female breast cells. Males given sufficient estrogen for a sufficiently long period invariably develop breast cancer if they belong to cancer-susceptible strain. In cancer-resistant strain, only few will develop cancer but after much longer period. This susceptibility of the breast cells to cancer is purely local, these particularly. There is no convincing evidence that it bears relationship to particularities of the sexual cycle or to other manifestations of sexual life. Cancer production in the breast of susceptible mice depends on the activity of the breasts, thus frequent breeding and lactation being about an increase of cancer incidence.

If one tries to apply the results of all the experiments (the author as well as those of others) described in the article to human cancer, it seems justified to draw a number of important conclusions:

The rôle of heredity in the occurrence of cancer in man has been much discussed. In the majority of cases, evidence in favor of hereditary susceptibility is rather vague and most examples could not survive the criticism of trained statisticians. On the other hand, it must be said that it is practically

impossible to trace the hereditary factor in human cancer back for an adequate number of generations. Human breeding is so haphazard that it is impossible to obtain anything like the clear evidence procured from mouse breeding. There are nevertheless few selected examples of familial cancer as well as statistical studies of small stable populations, in Norway, which suggest that in human cancer hereditary may play an important rôle. Such predisposition may be compared with cancer susceptibility in mice. In these cases one could not expect to see much of a precancerous condition. There is every reason to believe that in a strongly predisposed tissue cancerization occurs suddenly with little warning.

There are other cases of neoplasia in man in which the hereditary factor tends to create not read-made cancer but either conditions of benign tumor formation, such as rectal and colonic papillomatosis, or a semi-inflammatory semi-neoplastic condition such as xeroderma pigmentosum. In the former case ordinary irritation, such as fecal stasis, may transform the papillomatosis into carcinoma; in the latter condition in the latter exposure to sunlight may lead to the development of epithelioma.

The various forms of individual cancer, such as the lung cancer of the radium miners in Czechoslovakia, paraffin and soot cancer, aniline cancer, ray cancer and others, occur in individual who others could probably not have had spontaneous cancer, at least not in the particular organ affected.

In considering the great bulk of "spontaneous" cancer in man, in which the responsible factor has not been found, we must look for precancerous conditions. It seems probable, however, that no exact definition can be given at least in our present state of knowledge of what constitutes a precancerous condition. It is probable that any chronic condition of irritation may occasionally lead to cancer, some lesions more readily than others, and in all cases a constitutional factor undoubtedly plays an all-important rôle. Our task then is to remove or to heal any potential precancer before cancerization sets in. However the fight against cancer may go further than that. In view of the fact that the majority of precancerous conditions are all probable for long time to come escape our methods of detection, we must aim at strengthening the resistance of the organism generally. If the organism can overcome an infection before it becomes chronic, there will probably be no cancer. This may conclude by saying that however unsatisfactory our methods of detecting precancerous conditions may be, we must combat the onset of precancerous by all the methods which tend to improve the health of the organism.

Submitted: 11 July 1934

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